AVIATION WEEK

APRIL 4, 1955

A McGRAW-HILL PUBLICATION

50 CENTS

THE BEGINNING OF A NEW FUTURE

America's first jet transport, the Boeing 707 prototype, has already flown higher and faster than any other transport airplane.

Projected commercial versions would carry up to 130 passengers, cross the Atlantic in under seven hours and the U.S. in less than five.

The military tanker version, the KC-135, has been ordered by the Air Force and production is already under way.

America's first jet transport incorporates many revolutionary features as well as a great many proven ones in her design. One of the latter is her fuel gage system—the Honeywell Electronic Fuel Measurement System.

Boeing chose it over all others because experience has shown it to be the most reliable, accurate and easiest to maintain.

Many others, both aircraft manufacturers and air lines, have arrived at the same conclusion, as the Honeywell Electronic Fuel Measurement System is going into *every make of U.S. commercial transport plane now in production*. It's used on more than 80 types of military and commercial aircraft.

Electronic Fuel Measurement Systems for aircraft and missiles—including the new transistorized version—represent only one of the many Honeywell products in our line of controls for everything that flies. We expect the list to grow longer in future years—because automatic controls are so important to aviation progress. And *automatic control* is Honeywell's business.

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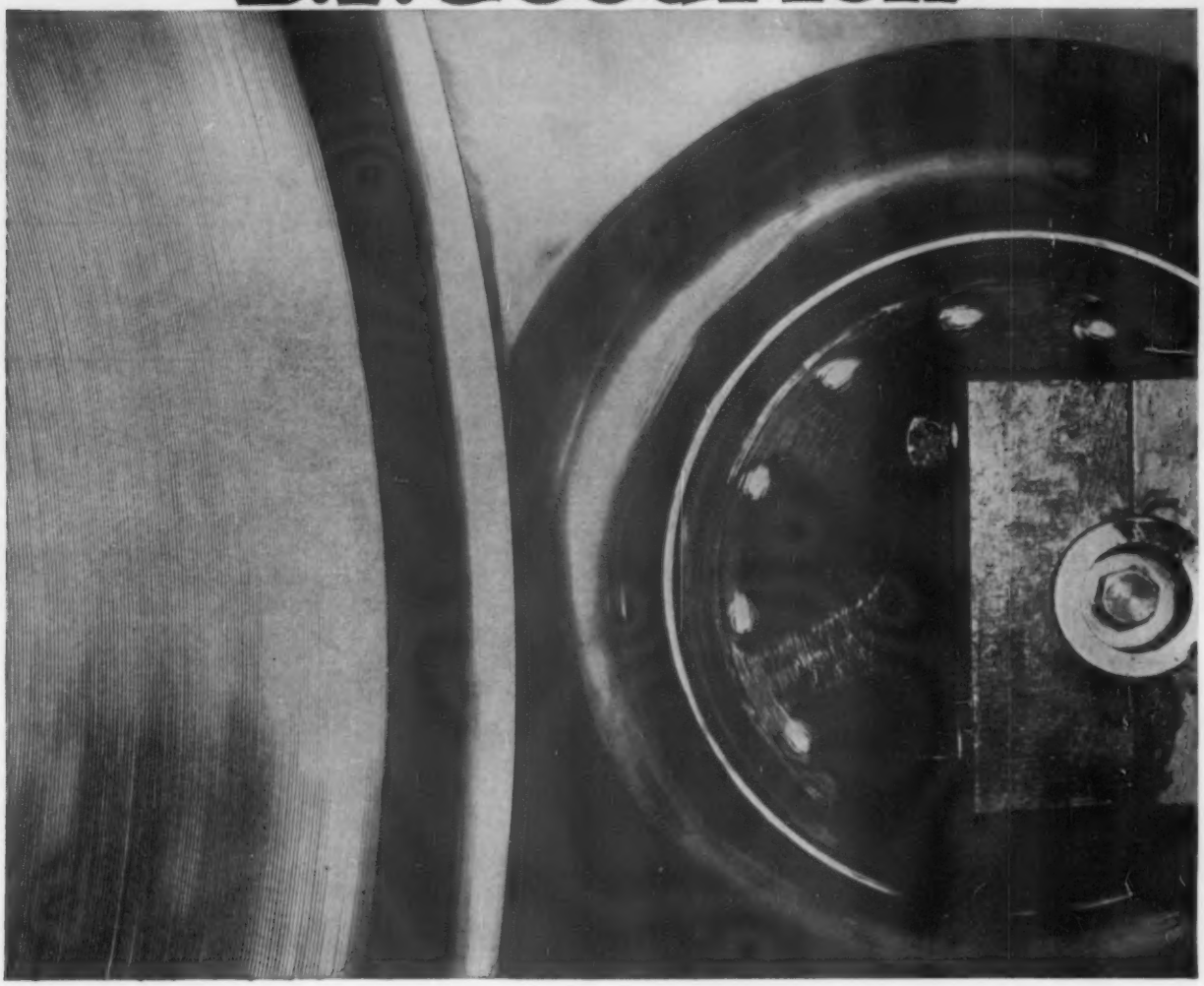
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



World's first 300 mph airplane tire —and it's B. F. Goodrich Tubeless!

B. F. Goodrich, inventor of the Tubeless Tire, announces a great new aviation advance—the world's first 300 mph airplane tire. Developed for ultra high speed military use, the new Tubeless Tire established the record for a high speed landing on B. F. Goodrich's new 300 mph dynamometer in Akron, shown above.

To simulate the complex stresses of actual landings, this new B. F. Goodrich 300 mph Tubeless Tire was set to hit the dynamometer's flywheel at an angle. Slammed against the whirling flywheel under 10,000 lbs. load, it instantly developed speeds up to 4,000 rpm—a combination of impact, friction and centrifugal force that would disintegrate an ordinary tire. After this 300 mph landing, the new Tubeless Tire showed no sign of failure. More landings were made, surpassing requirements for the tire. And even after 14 straight landings at 300 mph, the tire was good for more.

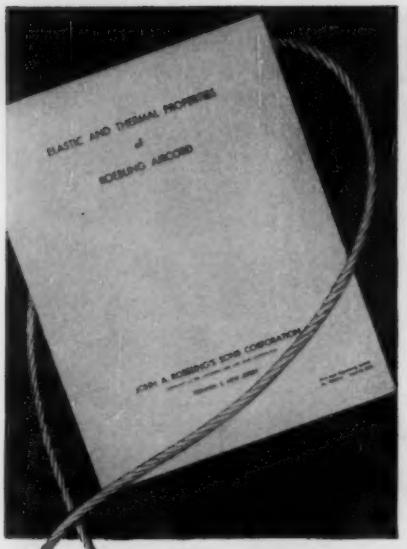
The new 300 mph tire is the latest addition to the B. F. Goodrich airplane Tubeless Tire line. Already in military and commercial service, B. F. Goodrich Tubeless Tires speed maintenance, cut weight—saving as much as 75 per cent of tube weight. They give safer take-offs and landings because tube troubles are eliminated.

Instead of an inner tube, the BFG Tubeless Tire has a patented inner liner that's part of the tire itself.

Result: There's no tube to blow out. No tube to add weight. And there's only one unit to mount and warehouse.

This new 300 mph Tubeless Tire is another example of B. F. Goodrich leadership in Tubeless Tire research and development. *The B. F. Goodrich Co., Aeronautical Sales, Akron, Ohio.*

B.F.Goodrich
FIRST IN RUBBER



Booklet describes

THERMAL

properties of

AIRCORD

DESIGNERS AND ENGINEERS find this Roebling booklet the most practical and accurate manual ever printed on the physical characteristics of airplane control cord.

One section deals with the thermal properties of Roebling Aircord. It graphically illustrates the relative "change in length" with "change in temperature" of aluminum alloys and various types of stainless steel and carbon steel Aircord . . . and shows the stainless steel type which most closely approximates the expansion rates of airframe aluminum alloys.

Other sections of the booklet deal with the elastic properties of control cord. Mail coupon below for your free copy. John A. Roebling's Sons Corporation, Trenton 2, New Jersey

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Aviation Week

APRIL 4, 1955 VOL. 62, NO. 14

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Table of Contents on Page 8

55,606 copies of this issue printed

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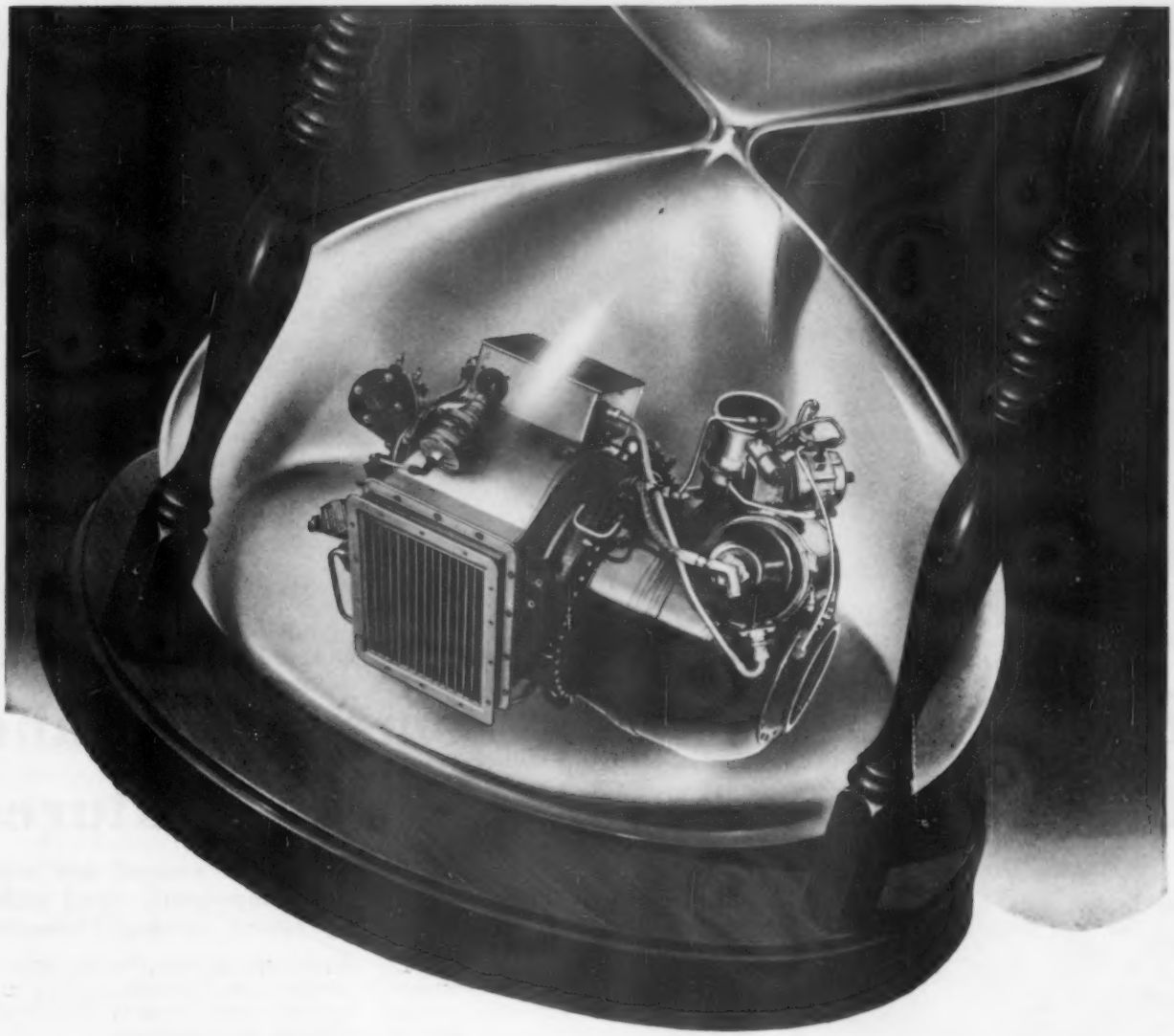

Small gas turbines pass test of time

New Milestones Gain Industry-wide Acceptance for AiResearch Power Turbines

AiResearch small gas turbine engines, first of this revolutionary class of turbomachinery to be developed, have now passed the following important milestones:

• 100,000 hours of actual service in the field • Successful operation up to altitudes of 53,000 feet • Completely reliable automatic control on production machines • Customer established overhaul periods of up to 600 hours on existing units • Design overhaul periods on new models of 1000 hours • All phases of military qualification (Including new shaft power and gas turbine compressor designs).

Pioneer in this field, AiResearch is first to develop and deliver combination units capable of delivering either shaft or bleed air power independently of each other. AiResearch has more experience with small gas turbines than all other manufacturers combined.

We are proud of the engineering-manufacturing team that has made possible these outstanding contributions to industry.

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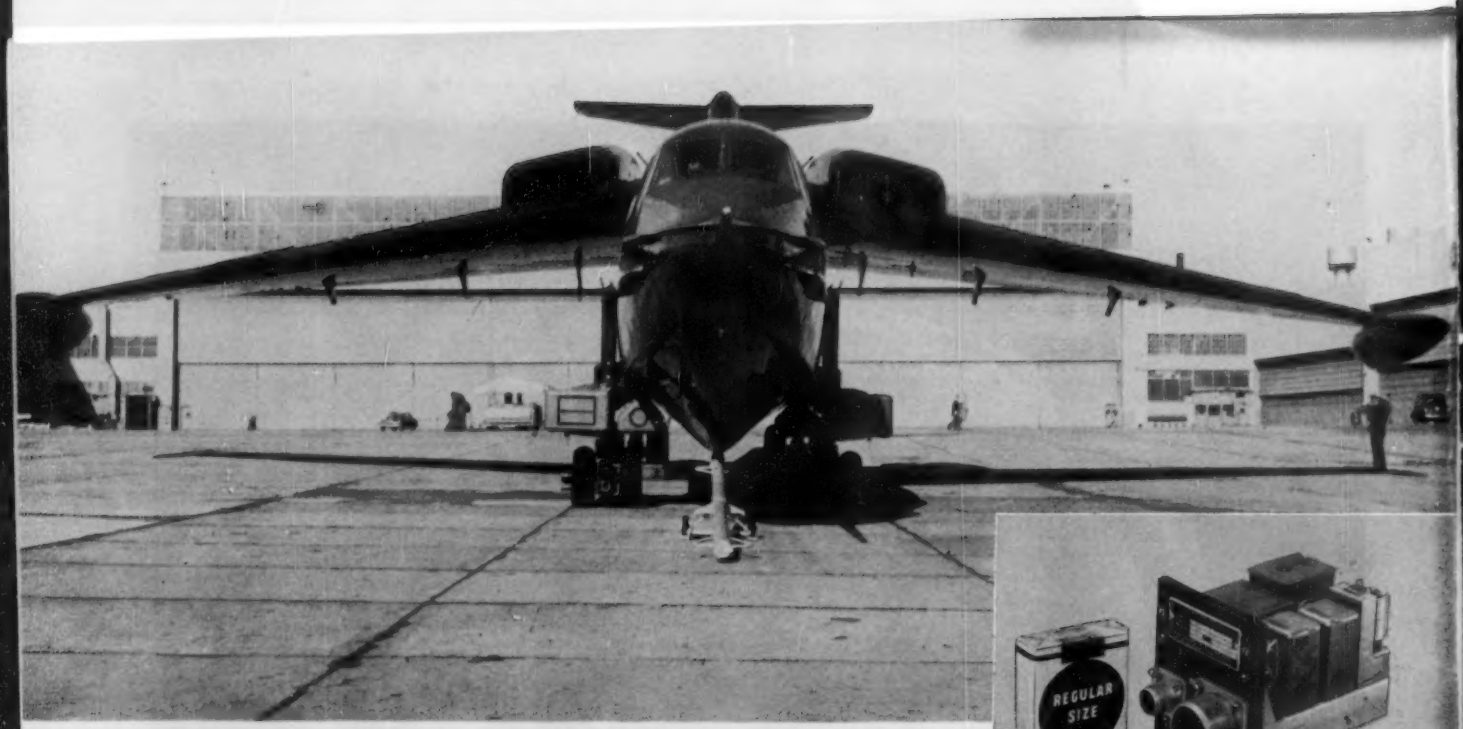
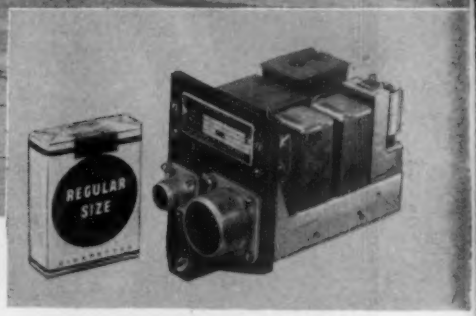
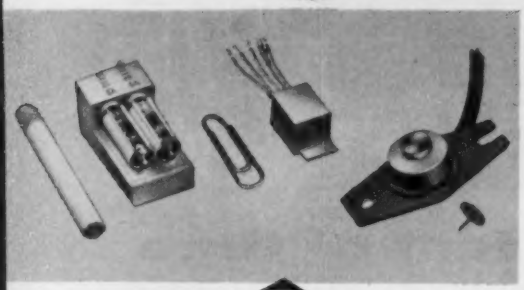


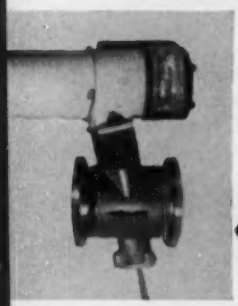
Martin's new XP6M is a radical departure in seaplane design. It features a narrow, streamlined hull and jet engine nacelles atop the wings. Four Allison J-71 engines with take-off afterburners push the XP6M to well over 600 mph and to altitudes of over 40,000 feet. Clifford amplifier is shown at right.



Martin XP6M's Cockpit Temperature and Anti-icing Controls Have Novel Features



Amplifier is small, compact, employs ruggedized tubes. Pulse unit (center) is smallest of its kind and of novel design. Tiny Clifford sensing element (right), smallest on the market, is fastened to skin, fully insulated against ambient temperature changes.



Electrically actuated hot air valve designed and produced by Clifford for Martin XP6M application.

Martin XP6M wing and tail surfaces are protected against icing hazards by Clifford temperature control systems that use tiny, novel skin temperature sensing element.

New Clifford system employs lightweight control box with unitized construction, miniaturized components, novel pulse element, and unique skin temperature sensing elements.

In addition to its small size and light weight, Clifford's new control box design embodies several important advantages in service.

Unitized construction makes it comparatively simple to locate a malfunction in service, quickly replace the unit containing the defective component, and get the plane back into the air.

Miniaturized, ruggedized components result in the smallest, lightest control possible for the job to be done. Elements within the box comprise an amplifier, which is highly compact and potted in resin, a novel pulse element smaller and lighter than comparable units, slave relays to operate valve actuators, a power supply, a calibration unit for the electrical bridge, and a radio noise filter.

Physical and electrical designs are both concerned with the performance-in-service factor. Electrical input valves are held to optimum levels to insure long trouble-free service. Physical arrangement of parts promotes maximum heat dissipation.

New skin temperature sensing elements, smallest such units ever made, are fastened to the skin to insure close, accurate sensing and control and protect the P6M against icing hazards.

Complete system of Clifford design and manufacture encompasses temperature sensing elements, temperature selector, and control box. On the P6M, wing and tail anti-icing systems are centralized with a common control box. The cockpit temperature control system is entirely separate, having its own control box, sensing elements, and associated high temperature air valves.

Information or consultation involving temperature control systems custom-built to the requirements of specific aircraft on which you may be working is available without obligation.

Write: Clifford Manufacturing Company, 136 Grove Street, Waltham 54, Mass. *Division of Standard-Thomson Corporation.* 7.5.4

HYDRON METAL BELLOWS — CLIFFORD MANUFACTURING CO. WALTHAM, MASS. — HEAT EXCHANGERS

NEWS DIGEST

Domestic

American Airlines last week ordered an additional 14 DC-7s from Douglas Aircraft Co., will take delivery on the new transports in 1956 and 1957. When the airliners are received, American will have a fleet of 39 DC-7s, 82 DC-6 types, 75 Convairs and nine DC-4s.

New York's LaGuardia Airport will require all aircraft operating at the field after May 1 to have two-way radios capable of reaching the control tower on both ground and air-to-ground VHF channels.

Pan American World Airways' Stratocruiser ditched 30 miles off the Oregon coast Mar. 26 after the No. 3 engine shook loose from the wing.

New $1.5-million calibration and test building for rocket engines is being constructed by North American Aviation at the company's propulsion field laboratory north of Los Angeles. The facility is scheduled to be completed July 20 and activated late this summer.

Five Sikorsky H-19s will take off Apr. 15 from Camp Rucker, Ala., on a 15-stop delivery flight to Ft. Kobbe in the Canal Zone. The Army helicopters will be demonstrated en route for government officials of Cuba, Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica.

Chance Vought Aircraft, Inc., Dallas, received a "multi-million-dollar" subcontract from Boeing Airplane Co. for production of modified B-47 nose sections.

First P2V-7 Neptune of a number ordered by the Royal Canadian Air Force was delivered by Lockheed Aircraft Corp. at Burbank, Calif. RCAF's maritime reconnaissance service will use the bombers for anti-submarine and convoy patrols.

United Air Lines will offer overseas airfreight service under a new agreement with Air Express International Corp.

Stress analysis of propeller blade retention system will be studied by the Illinois Institute of Technology at Chicago under a $29,904 research grant from USAF's Wright Air Development Center.

AC Spark Plug Division, General Motors, Milwaukee, has entered the turbojet fuel control systems field, with initial items scheduled for afterburners. Fuel control work formerly was done by GM's Products Division at Rochester, N. Y.

Vector-System Helicopter Is Easy to Fly

Vector-system replaces conventional cyclic pitch controls on the de Lackner DH-4 heli-vector. Proto-type weighs 180 lbs.; production versions are expected to weigh only 125 lbs. Two 15-ft. coaxial rotors beneath the pilot are driven by a 30-hp. Kiekhaefer Mercury outboard motor. Top speed is estimated at 65 mph. and range at 15 miles. Hiller Helicopters Inc. is among other companies developing heli-vectors in hopes of Navy and Marine contracts.

Financial

Trans World Airlines reports a record net income of $10,336,132 for 1954, double the previous year's $5,064,392. Gross for 1954 was $203,671,295 compared with 1953's $187,220,806. TWA says the record profit was achieved without federal aid, marking first time a U. S. or foreign flag carrier has achieved subsidy-free transoceanic services.

Northwest Orient Airlines' net income for 1954 totaled $2,415,524, increasing from $1,944,693 the previous year. Operating revenues amounted to $63,595,851, compared with $61,955,438—not including $4,184,589 from the Pacific airlift. Operating expenses dropped to $58,884,554 from $62,996,996. For the first time since 1947, NWA had no outstanding bank loans or long-term debts at the end of the year.

Kaman Aircraft Corp., Bloomfield, Conn., declared a 10-cent dividend, payable Apr. 15 to stockholders of record Apr. 5.

International

First pre-production Vautour of Sncaso's S.O. 4050-B bomber series was delivered to the French Air Force at Melun Villaroche air base. Powered by two 6,160-lb.-thrust Snecma Atar 101 turbojets, the Vautour has exceeded 620 mph. during test bombing runs.

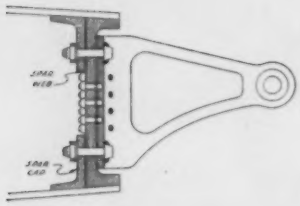
Labor troubles may keep West Germany's Lufthansa from starting operations this month. Negotiations between the airline and German transport unions broke down after labor representatives rejected Lufthansa's wage offers, reported to be about 70% of the average for air carriers in northern Europe.

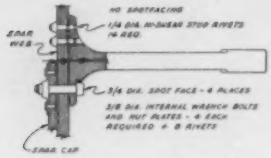
Two Super Constellation 1049s, leased by British Overseas Airways Corp. from Seaboard and Western Airlines, started service Apr. 1 on BOAC's New York-Bermuda route.

Britain's Flight Refueling, Ltd., plans to build a production plant in Canada, probably at Toronto. The new manufacturing facility will be operated by the company's subsidiary, Flight Refueling (Canada).

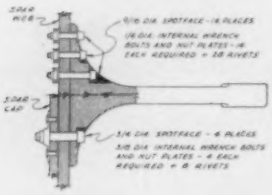
Guided Missiles will be developed by Canada's Avro Aircraft, Ltd.

WHY SPOT FACE AWAY THE FITTING?




NO SPOTFACING
1/4 DIA. HI-SHEAR STUD RIVETS 14 REQ.
3/4 DIA. SPOT FACE - 4 PLACES
3/8 DIA. INTERNAL WRENCH BOLTS AND NUT PLATES - 4 EACH REQUIRED + 8 RIVETS

Excessive spot facing, weight, and bulk are eliminated from removable fittings such as aileron hinge brackets, when HI-SHEAR stud rivets are used to carry the shear loads. On the above example four bolts speed up removal or installation of the fitting in the shop or on the flight ramp.


5/16 DIA. SPOTFACE - 14 PLACES
3/8 DIA. INTERNAL WRENCH BOLTS AND NUT PLATES - 4 EACH REQUIRED + 28 RIVETS
3/4 DIA. SPOTFACE - 4 PLACES
3/8 DIA. INTERNAL WRENCH BOLTS AND NUT PLATES - 4 EACH REQUIRED + 8 RIVETS

Fittings using bolts to carry the shear loads, require spot facing in fillet areas. These fittings must be heavier in weight to retain strength to avoid stress concentration and are larger in size to obtain bolt clearances. In example, the fitting with bolts suffers a weight increase of about 30% and requires removal or installation of an additional fourteen bolts.

WRITE
for the HI-SHEAR Standards Manual for specific data on the HI-SHEAR stud rivet.

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The Aviation Week

April 4, 1955

Headline News

Congress Splitting Over Tacan/DME.. 13
Hoover Group Reports on MATS..... 14
Lockheed Gives Up Turboprop Connie. 15
Air Defense Tries Out Atomic Missiles. 16
USAF Seeks Better Management..... 17
Republic, Fairchild Profits Higher..... 18
Ford Tri-Motor Nearing Completion.. 21
Military Aviation Obligations..... 21
CAB to Air Inspection Proposal..... 25
Bell Aims Copter At Ore Hunters.... 26
Learstar Gets New Navaid..... 26
SEC Reports Aviation Stock Deals.... 28

•

Aeronautical Engineering

MATS Reports Turboprop Tests..... 22
How Air Weapon System Is Evolved.. 32
Defense Dept. Opens Titanium Lab... 34

•

Production

Rolls-Royce Ues New Assembly Line.. 36
How Goodyear Makes B-47 Canopies.. 45
No-Rod Welding for Titanium..... 46
Production Briefing 60

•

Equipment

Square-Thread Insert Locks Bolts..... 64
Conveyors Speed Overhaul at NWA... 67
Off the Line..... 69

•

Air Transport

CAB Draws Up Nonsked Limits..... 12
Capital Traffic Cure Stirs Fight..... 21
Cockpit Viewpoint 75
AA Renews Airfreight Campaign..... 79
Senate Committee Praises Feeder Report 80
Policy Draft Release Unlikely..... 81
EAL Route Near Decision..... 82
IATA Cuts Atlantic Cargo Rate..... 82
LA Airport Raises Rent..... 82
Braniff Asks to Void Merger..... 83
CAB Orders 83
Shortlines 83

•

Editorial

More Wigg Flipping In Britain..... 94

•

Departments

News Digest 7
Industry Observer 9
Who's Where 9
Washington Roundup 11
USAF Contracts 42
Navy Contracts 58
New Aviation Products..... 70
Also on the Market..... 72
Aviation Calendar 76

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WHO'S WHERE

In the Front Office

Robert B. Murray, Jr., former Commerce Undersecretary for Transportation, has recently joined Baldwin-Lima-Hamilton Corp., New York, as special assistant to the president.

Stanley C. Kennedy, Sr., will resign as president of Hawaiian Airlines next July to become chairman of the board. His successor will be **Arthur Dee Lewis,** who joined the airline last month as executive vice president.

Gordon M. Bain, former director of Civil Aeronautics Board's Bureau of Air Operations, was elected executive vice president of Slick Airways. New directors: **John R. Alison,** vice president of Northrop Aircraft and former Assistant Secretary of Commerce for Air; **Maj. Gen. Fred S. Borum** (USAF Ret.), and **John S. Graham,** one-time Assistant Secretary of the U. S. Treasury.

Charles H. Calhoun became vice president-engineering and maintenance for Continental Air Lines.

Changes

Bruce G. Eaton, Jr., was appointed senior advisory engineer for Westinghouse Electric Corp.'s Air Arm Division, Baltimore. Other changes: **Hubert H. Krebs,** superintendent of production; **Trevor Clark,** assistant to the engineering manager.

Dr. Carl L. Kober, who helped develop Germany's Wasserfall and V-2 rocket teleguiding systems in World War II and has worked at USAF's Wright Air Development Center since 1949, joined General Mills to take charge of airborne systems evaluation for the Mechanical Division, Minneapolis.

Ronald M. Hazen moved up in General Motors Corp.'s Allison Division at Indianapolis from engineering director to technical assistant to the general manager. **Dimitrius Gerdan,** former chief engineer for turbojets, is new director of engineering. Additional changes in aircraft engine operations: **R. E. Settle** and **T. S. McCrae,** executive engineers; **C. J. McDowall,** chief engineer of advanced design and development; **J. B. Wheatley,** assistant chief engineer on advanced design; **C. E. Hockert,** chief engineer of turbojets; **J. R. Gretzinger,** chief engineer of fuel systems; **J. C. Schmid,** assistant chief engineer.

Jack W. Gailey is new general manager of Dallas Avionics, succeeding **W. D. Price, Jr.,** who resigned.

Juan Ucros was promoted by Avianca, Colombian national airline, to traffic and sales manager.

Honors and Elections

Dr. Theodore Von Karman, professor of aeronautics emeritus at California Institute of Technology, Berkeley, was elected to a full foreign membership in the French Academy of Sciences and elevated to the rank of full commander in France's Legion of Honor.

INDUSTRY OBSERVER

► Wright J65 Sapphire turbojet recently survived a rugged emergency on the Lockheed F-104 at Edwards AFB, Calif. Tony LeVier, Lockheed test pilot, was making gun-firing runs with the F-104 when an ejected cartridge link punched a hole in a fuel tank. Raw fuel sprayed into the Sapphire air intake where it was sucked into the engine causing extremely rough running. LeVier managed to bring the plane in for an emergency landing on the dry lake bed. Sapphire indicated no damage from this rugged accident.

► Boeing's new order for KC-135 jet tankers (AW Mar. 7, p. 13) comes to 169 planes. This is in addition to the original program for 88 tankers established when USAF gave Boeing its initial KC-135 order last year. KC-135 program now calls for 257 aircraft.

► Flettner Aircraft Corp. design studies for large helicopters are aimed at 32,000 lb. gross weight and a 6,000 lb. payload. Current helicopter heavyweight is the Piasecki H-16 at about 30,000 lb.

► A new in-flight refueling system, using two semi-rigid tubes and a balljoint configuration to replace the currently used refueling hose, has been patented by Flight Refueling Inc., Baltimore, Md. Company makes probe-and-drogue inflight refueling equipment (AW Jan. 26, 1953, p. 26).

► TF-102, Convair's trainer version of the supersonic interceptor, is scheduled to fly in October at Edwards AFB. Craft has side-by-side seating, will carry two radar scopes, have same fire control system as F-102 and will be fitted to take full armament, indicating that in emergency, with its supersonic speed, it could be used for combat service.

► Canada's Avro Aircraft will fit Orenda-Powered CF-100 with experimental tailpipe thrust augmentor (burning within tailpipe) for about 15% boost in power, in association with Marquardt Aircraft Co. developed variable-area, iris-type nozzle, primarily used to give exhaust opening for optimum specific fuel consumption during cruise. Iris-type unit also holds good promise for refinement into reverse thrust device, in addition to its basic job as exhaust nozzle.

► Republic F-105, sweptwing fighter-bomber, probably will be rolled out in about three or four months. Plane will incorporate wing root air inlets for its Allison J71 turbojet powerplants.

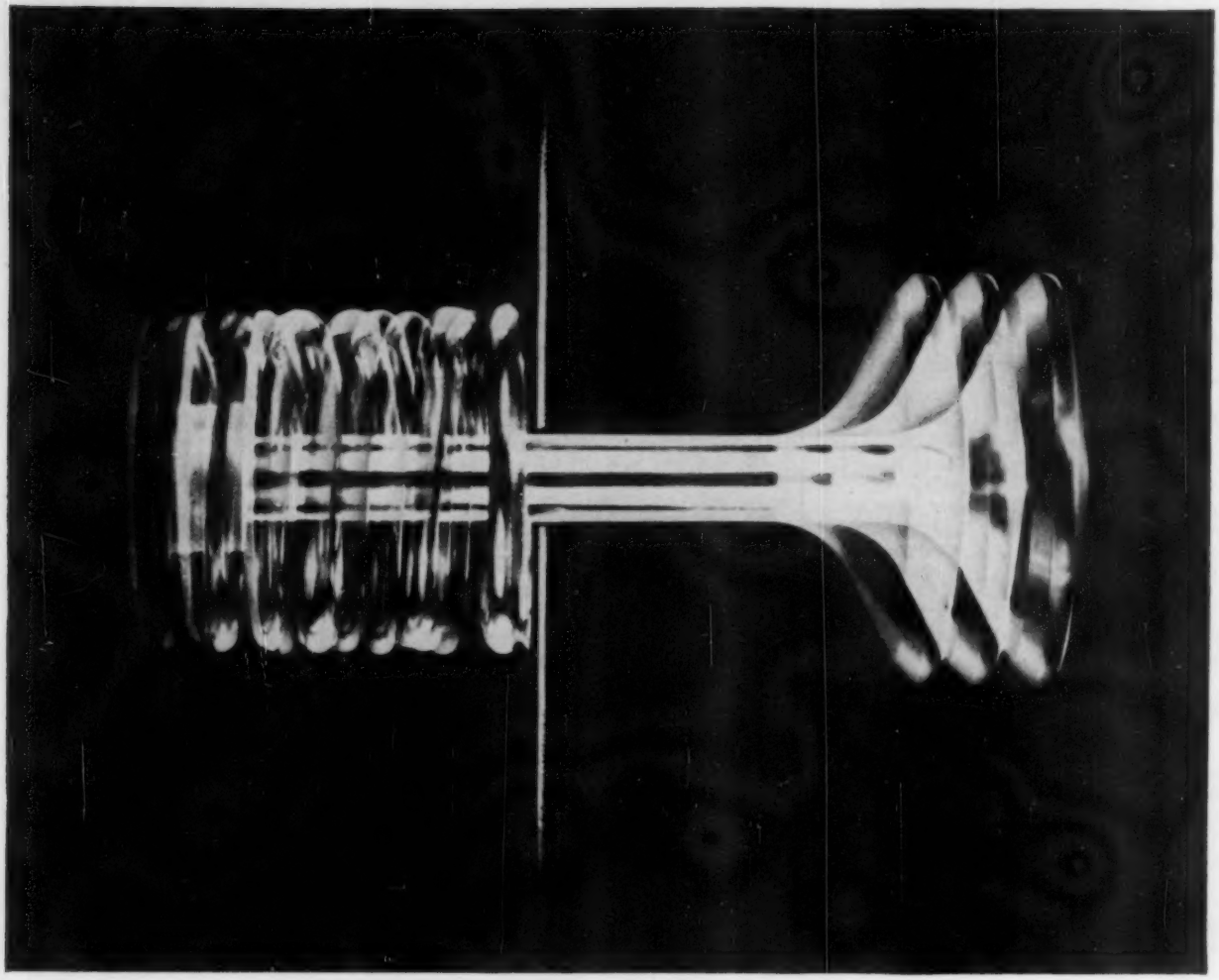
► Avro Canada's C-105 long-range interceptor is scheduled for rollout this fall. Initial quantity will consist of one static test article and two prototypes. Additional schedule for 18 more of the planes may come soon. Plane will be fitted with Hughes fire control system.

► Ryan jet-powered Firebee target drone may be used for photo reconnaissance work and as a combat missile with own guidance. Plane should have good tactical potential because of its performance—over 600 mph. speed, more than 40,000-ft. altitude, 1 hr. 20 min. duration, 500 lb. payload.

► Hughes Aircraft's Falcon missile is being refitted with a streamlined radome with good electronic characteristics, replacing the round blunt-nosed radome shown on recently released Falcon pictures. USAF pilots who saw the movies of the Falcon operating against jet F-80 drones were startled by its effectiveness.

► Cornell Aeronautical Laboratory is conducting windtunnel tests on the Grumman F9F-9 Tiger, Navy's supersonic fighter. Windtunnel tests are being made to obtain more accurate engineering data on the F9F-9. More than 150 hr. of test time have been logged in the variable-density windtunnel, all of it in the transonic range.

► French Gerfault 1B delta wing prototype of a forthcoming supersonic fighter, which has been flying with a new wing of increased area, has exceeded Mach 1 in level flight. Gerfaut 1B exhibits much shorter takeoff and landing characteristics than the earlier 1A.



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Washington Roundup

Shakeup in Pentagon

Responsibility for major shakeup in military public relations, which hit the Pentagon a hard blow last week, actually rests in the White House, where two recent Navy indiscretions left red faces, including one on the President. Defense Secretary Charles E. Wilson took the bull by the horns after getting a dressing down from his boss, then made all the decisions and is reported to have written the directives himself.

Immediate causes of all the trouble: Adm. Robert B. Carney's use of a small press conference to give the public his opinion about the imminence of war with China and Cmdr. Eugene P. Wilkinson's forthcoming series of articles for the Saturday Evening Post on the atomic submarine.

First directive from Wilson's office put a curb on military people who want to talk or write for publication, ordered them to get clearance from the civilian secretary of their own service before talking or writing. Verbiage created some confusion in public information offices but while the discussion went on the second bombshell dropped. It was an order calling for eventual reduction of one-third to one-half in information staffs and replacement of top military officers by professional civilian public relations personnel. Men to be replaced are Army's Maj. Gen. Gilman C. Mudgett, Navy's Rear Adm. William G. Beecher and USAF's Brig. Gen. Brooke E. Allen, who was in the process of giving his chair to Col. Robert Lee Scott (AW Feb. 28, p. 12).

Indications are that none of the services were consulted, at least at the uniformed level, and the changes came as a surprise. Still awaiting clarification is Wilson's declaration that everyone in the department will be held personally responsible for seeing that information they release is "consistent with the national security and the policies and objectives of the Department of Defense."

Almost certain to be interpreted as a gag on critics is Wilson's view that there must be "a determination of whether release or publication of the material would constitute a constructive contribution to the primary mission of the Department of Defense."

Preparedness Investigation

Senate Armed Services Committee has revived its Preparedness Investigating Subcommittee, which made top news with its reports on the defense program in the last Democratic Congress (1951-53). Five members named to the group also served on the old investigating subcommittee: Sen. Lyndon Johnson, chairman, Sen. John Stennis, Sen. Estes Kefauver, Sen. Styles Bridges and Sen. Leverett Saltonstall. The two new members: Sen. Stuart Symington and Sen. Ralph Flanders.

Two subjects the subcommittee is expected to consider are the guided missile program and airlift. Stennis and Symington have already recommended these investigations (AW Mar. 7, p. 14).

More Airline Audits

Civil Aeronautics Board plans to increase its audits of airlines—if its fiscal 1956 budget request of $4 million is approved by Congress. This is about $300,000 more than CAB has this fiscal year. CAB member Chan Gurney told Senate Appropriations Committee that audits of subsidized carriers would be made every year and audits of non-subsidized lines, every other year. At the present time, subsidized carriers are audited every other year; non-subsidized, every third year.

Senate committeemen objected to the action of House Appropriations Committee in cutting CAB's request of $15.2 million for subsidy payments from now until July 1 to $5 million.

Army Sensitivity

Creation of new Aviation Division in Office of the Assistant Chief of Staff, Operations (G-3) (AW Mar. 21, p. 20), already has resulted in comment hitting Army in a highly sensitive spot: accusation that they are setting up their own Air Force. Pentagon observers feel Army's failure to announce elevation of its aviation activity to new status was due to its eagerness to avoid jabs from press, queries from Congress while budget is under consideration.

Brig. Gen. Hamilton H. Howze, chief of the new division, has returned from his orientation tour of Army air establishments, ready to tackle a tough job calling for maximum display of skill to fly through military and legislative flak that is bound to burst nearby.

Little known fact about the Army's new aviation chief, which provides an interesting quirk of history, is name of his father: Maj. Gen. Robert Lee Howze. Through seniority, the elder Howze was president of the 9-man court that court-martialed Billy Mitchell, busted him out of the Army for insubordination on air power issue.

Fewer USAF Generals

Air Force plans to increase the number of general officers from 410 to 443 during the next fiscal year have been dampened. A Senate Armed Services Subcommittee has recommended a ceiling of 425 on the number of USAF generals by July 1956. For the other services, the subcommittee recommended these ceilings on general officers as of that date:

- **Army, 494.** This is the number planned and two less than the present 496.
- **Navy, 287.** Navy planned 290, at present has 284.
- **Marine Corps, 60.** This is the present number and the number planned.

Airport Tangle

Dispute over a solution to Washington's crowded airport situation continues with no sign that recommendations of the Presidential Advisory Committee offer any substantial answer (see p. 21). Chief stumbling block is a suggestion that Baltimore's Friendship Airport be used as an alternate to Washington National Airport to relieve congestion.

Maryland Senator John Marshall Butler has picked up the ball in the effort to force the airlines to use Friendship, but he has hit a stone wall with the carriers. In a meeting with Butler, airline representatives told him the idea just won't work and he might as well forget it.

In answer to a Butler request for Civil Aeronautics Board action, Acting Chairman Joseph P. Adams told Sen. Butler the Board had the power, and that the staff is studying the matter. He also said that in view of the difficulties involved in such a proceeding, the CAB isn't at all convinced it should go ahead with it.

—Washington Staff

AVIATION WEEK VOL. 62, NO. 14
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CAB Examiners Restrict Nonsked Role

Possible certifications for irregulars hinted; special and charter flights would be authorized.

By Craig Lewis

A definite, restricted sphere of operations for nonscheduled airlines is recommended in a report by two Civil Aeronautics Board examiners in the marathon irregular air carrier case.

The examiners, Ralph L. Wiser and Richard A. Walsh, have written a report which brings nearer to completion the largest, longest case the CAB has ever processed. It has run 42 months and 50,000 pages of testimony.

The report doesn't open up any new horizons for the irregulars, although there is a hint of possible future certification, but it does define specific status and areas of operation.

▶ **New Classification**—Under the examiners recommendations, irregulars would be classified Large Supplemental Air Carriers.

Two types of supplemental and charter operations would be authorized:

• **Charter Service** would involve transportation of persons and property on planeload contract on a flight for the charterer's own account. A carrier could charter one half or more of an airplane's capacity to a charterer and could use the remainder to fill another charter of half or more of airplane capacity. No restriction of frequency or regularity would be applied.

• **Special Service** would involve general types of air transportation, but would be subject to restriction of three flights in each direction between any two points during a calendar month.

A time limit of five years is suggested for the supplemental authorizations as an adequate period to allow the carriers to develop this type of operation and give the CAB a period to review its success in deciding on future action.

The report recommends an air exchange to serve as a clearing house for charter information. Such a plan is currently under consideration by the Board in a separate case.

CAB Authority

In recommending these forms of service for irregulars, the examiners find that CAB does not have the power to issue regular certificates of public convenience and necessity for supplemental service. This stand is based on the finding that under the Civil Aeronautics Act, certificates must define routes and points to be served and cannot specify limitations on operations such as those applied to supplemental service.

No such limitations are found in the Board's exemption powers, however, and the proposed authorizations would be issued as exemptions, rather than certificates.

The proposed regulations would not permit aircoach operations of the North American Airlines type, but they would have little effect on the other operations conducted by the majority of irregular carriers. Currently, the industry does about 10% of its business in commercial charter and splits the rest between common carriage and military traffic.

Background

Most irregular carriers engage in military operations. Figures in the report show that the irregulars get nearly half the yearly business done by commercial airlines and make between 40 and 50 million dollars a year.

The Large Irregular Air Carrier Investigation was started in September 1951 as a general probe of the situation. Its purpose was to determine what role, if any, the irregulars should have in the nation's air transportation pattern. If a need for their services was found, the investigation was to assign them status, decide which applicants should conduct the services and define the regulations under which they would operate.

When all the issues and parties had been consolidated, the proceeding wound up with 60 applicants, 25 intervenors and CAB's Bureau of Air Operations participating, and with 208 applications involved.

▶ **Experimental Period**—A great variety of services were asked for by the applicants. The examiners concluded that

Magnuson Plan Favors New Air Carriers

A new proposal stressing the right of new entry into air transportation has been introduced by Sen. Warren Magnuson, Chairman of the Senate Interstate and Foreign Commerce Committee.

Both Magnuson and Chairman Percy Priest of the House Interstate and Foreign Commerce Committee have stated that the role of nonscheduled carriers will figure importantly at hearings this session (AW Mar. 28, p. 84).

Magnuson's proposal, made as an amendment to an omnibus civil aviation bill which he also introduced, would do this:

• First, modify the declaration of policy in the 1938 Civil Aeronautics Act to emphasize the "competitive" goal of air transportation development.

Magnuson's proposal directs "the encouragement and development of a competitive air transportation system. . . ." It adds a provision that regulation shall "foster the growth of competitive economic condition." (The 1938 act does not include "a competitive" and states only that regulation shall "foster sound economic conditions. . . .")

While the 1938 act provides for "competition to the extent necessary," Magnuson's proposal provides for: "Competition to the maximum extent consistent with the economic characteristics of the industry giving full recognition to the benefits derived from the certification of new competitive carriers in promoting the sound development of an air transportation system meeting the needs of the traveling public."

• Second, the burden of proof would be shifted from the carrier to the Board in the award of certificates. Magnuson's proposal directs the Board to issue certificates "unless it finds that the applicant is not fit, willing, and able to perform (air) transportation properly and to conform to the provisions able to perform such transportation properly . . . or that the public convenience and necessity will not be served thereby."

Another amendment introduced by Magnuson would establish a subsidy administrator, reporting to the CAB chairman.

it would be in the public interest to authorize charter and special service transportation "by the qualified operators of large aircraft for a period allowing a reasonable opportunity to experiment and develop further this transportation."

The report also names 33 irregular carriers which should get the new authority and 27 which should not.

At the end of 1953, evidence on the qualifications of half the 60 applicants had been taken. At that point, the CAB decided it had enough of a cross-section of the industry to make a judgment on its place in air transportation and, in the interest of speeding a decision, decided to stop taking evidence on individual carriers and concentrate on the general issues.

Judgments

Wiser and Walsh make individual judgments on the 30 carriers which were individually examined. Of these, 17 were found qualified and 13 unqualified for the proposed new authority.

On the remaining 30 applicants a "grandfather" standard was used. Those carriers which were operating in the last six months of 1954 were recommended for supplemental service authority. Those which didn't operate in that period were rejected.

In the final count of 27 carriers whose applications were found inconsistent with the public interest, five are operating companies—All American Airways, Currey Air Transport, Great Lakes Airlines, Modern Air Transport, and the United Export Co.

▶**New Entry Policy**—Included in the recommendations is a set of proposed rules and regulations under which the large supplemental Air Carriers would have to operate.

In dealing with the question of entry of new air carriers into the certificated ranks, the report comes up with a recommendation that the CAB adopt a policy on the issue. It is suggested that the policy should be that formal proceedings be initiated to consider expansion of the number of certificated carriers on a route when the volume of Large Supplemental Carrier traffic exceeds 15% of the certificated carrier traffic on the route for a substantial period.

Large Supplemental Carriers responsible for the traffic could apply for and get a certificate in such a proceeding if they made the necessary showing.

▶**Irregulars Unhappy**—Another recommendation is that the CAB conduct an informal investigation of coach services on transcontinental and west coast routes of American Airlines, Trans World Airlines, United Air Lines and Western Air Lines in relation to available traffic. The investigation would determine whether a formal CAB proceeding is justified to require the carriers to increase coach service.

The irregular carriers aren't happy with the findings of the examiners. They consider the recommendations too restrictive, and will probably campaign for some modification of them when the CAB comes to make a final decision.

Irregulars hope that congressional action will establish some type of service for them that will be more liberal than that advocated by the report.

Settlement Bid

North American Airlines' latest move in its running fight with Civil Aeronautics Board for survival as a four-airline operating unit was a proposal to the Board to settle the two-year-old enforcement case.

CAB is considering an examiner's recommendation that the nonscheduled group be eliminated for violations of the Civil Aeronautics Act (AW Feb. 21, p. 108).

North American's proposal for settlement is very similar to one rejected by CAB a year ago. The Board again is asked to dismiss the enforcement and compliance proceeding, then North American carriers would surrender their letters of registration.

However, the nonscheduled group proposes to continue unlimited operations pending final decision in four pending certificate application cases. The offer provides that no more than nine aircraft would be operated, the number now owned.

Conflict Develops in Congress On Handling Tacan-DME Dispute

Congressional efforts to resolve the dispute between the military Tacan short range air navigation system and the distance measuring portion of civil VOR/DME system appear headed toward a conflict of their own.

The Senate seems to favor a joint Congressional investigating committee to eliminate the various independent committee inquiries initiated a month ago. Neither of the two House committees reviewing the Tacan-VOR/DME controversy have expressed any desire for a joint group.

▶**Senate View**—However, the Senate Commerce Committee last week approved a concurrent resolution for creation of a special joint committee to study the existing common system of air navigation and the proposed changes recommended by the Air Navigation and Development Board.

Chairman Warren Magnuson said the Commerce Committee is convinced that establishment of a joint group to explore thoroughly the whole problem of common system is the most desirable way of resolving the controversy.

Committee amendments to the joint committee resolution, which was sponsored by Sen. Styles Bridges increased the proposed membership to 16. Representation would be evenly divided between House and Senate and the members drawn from the committees on Appropriations, Armed Services, Commerce and Foreign Relations. It was further amended to require an interim report no later than June 30 and a final report by Dec. 31, 1955, at which time the joint committee would die. Expenditures not in excess of $125,000 would be authorized.

Observers predict speedy Senate approval once the resolution clears the Senate Rules Committee. However, expectations are that when the House refers it to its Rules Committee, the resolution will be pigeonholed.

▶**Hearing Near End**—In the meantime, the transportation subcommittee of the House Commerce Committee plans to wrap up its hearing phase of the Tacan-DME dispute. Final witness before chairman Oren Harris' group is to be Max Karant, assistant general manager of the Aircraft Owners & Pilots Assn., an opponent of Tacan.

The House Commerce Committee perhaps has made the most extensive examination of any of the investigating committees and strongly feels the subject falls within its jurisdiction.

They don't profess to have complete technical knowledge but are relying heavily on the testimony of the many military and civilian experts who have appeared before them.

Brig. Gen. Milton Arnold, Air Transport Assn. vice president, summed up the controversy for the committee with a challenging question: "Are the stated military requirements for Tacan valid?" The committee's reaction, expressed by

Weapon Systems

The weapon system concept has become the leading factor in military production developments. On page 32 of this issue Aviation Week presents an article by Senior Engineering Editor Irving Stone on "How an Air Weapon System Is Evolved." This is the first of a series on weapon systems. Subsequent issues will contain articles on weapon system development and operations.

Rep. Carl Hinshaw: "We'll just have to accept the military on their word. How are we going to judge the validity of military requirements? To do so would be shifting a tremendous burden of responsibility."

▶**Must Accept Burden**—Gen. Arnold told the committee that the substantial amount of money required from the government to complete installation of DME cannot be justified unless in the committee's evaluation it is concluded that VOR/DME will meet the military requirements.

If the VOR/DME will not satisfy the military, Gen. Arnold continued, we have no choice but to accept the economic and operational burden imposed by the transition to Tacan in the interest of a common system.

The committee expressed great interest in the fact the scheduled airlines had not purchased airborne DME sets despite their production and availability. Gen. Arnold said ATA had warned its member airlines more than five years ago not to buy DME because the Tacan conflict was foreseen then. Gen. Arnold said he had personally pleaded with the Bureau of Budget as late as 1952 not to seek appropriations for CAA installation of DME in view of the brewing conflict.

▶**Aviation Week Cited**—The ATA official told Rep. Hinshaw that it was not his responsibility to warn other potential purchasers of DME, and that information on the dispute was available publicly. He referred to an article in AVIATION WEEK, Dec. 7, 1953, which Chairman Harris ordered included in the record.

When Gen. Arnold told the committee that ATA carriers would not be damaged by abandonment of civil DME the concern shifted to possible compensation for the private corporate flyers who have bought the some 69 units sold. No immediate solution was forthcoming but such a proposal for compensation to purchasers of good faith is being viewed as an avenue toward dropping DME.

DME supporters, however, hope to retain and continue the use of DME while the development of Tacan proceeds. A major effort is being made to sell the military a compromise in the Nav Panel of the Air Coordinating Committee. The Nav Panel is reviewing the ANDB-Tacan decision for ACC with a report due Apr. 16.

Rep. Harris' committee might take the initiative. The group has explored the DME question from all sides, barring the final witness. Their explorations included a Navy flight demonstration of Tacan. "It was an incredible performance," Rep. Harris reported after a flight which included inspection of the Navy Tacan ground installation at Atlantic City, N. J.

Hoover Group Report Asks Single Military Air Transportation System

Return to a single military Air Transport Service, wider use of commercial carriers and a cut in the number of administrative aircraft operated by the three military services, was recommended to Congress this week by the Hoover Commission.

Criticizing the growth of "Empire Building" by air transport services such as the Navy's Fleet Logistic Air Wings, Air Materiel Command's Log-Air and the vast fleet of military transports attached to various base commands, the commission suggested that the Defense Department set up a Director of Transportation to supervise all transportation.

▶**536 Aircraft**—In a study of the MATS operation, the commission found that its routes parallel those of the domestic and international airlines in all but a few instances such as in the Arctic and northern Canada. It said MATS operates 536 planes, 425 of them in the 4-engine category. The cost in Fiscal 1954 was $481,400,000, up from $460,400,000 in 1953 and $90,700,000 in 1952.

MATS personnel has grown from 91,797 in 1951 to 103,268 last June 30. In Fiscal 1954 it carried 1,832,000 domestic and 342,000 international passengers.

In a stern attack on the economics of the MATS operation, the commission linked its expenses to the amount of money paid out by the government to subsidize the commercial carriers. Says the report:

▶**Subsidy Reduction**—"If the United States international airlines were to obtain 25% of the passenger volume and 50% of the military mail shown as moved by Military Air Transport Service alone for the fiscal year ended June 30, 1954, the international commercial carriers would have reduced their subsidy bill by $42.9 million, almost 88% of the total amount.

"Moreover, to the extent that MATS curtailed its operation to conform to this proposal, the government would effect actual out-of-pocket savings through a proportionate reduction in MATS costs," the commission, which is headed by former President Hoover said.

The report pointed out, however, that steps have been taken recently by the Defense Department to give regular carriers an $18 million increase in revenues on international runs.

It made a strong point of the fact that airline subsidies are justified in part in the argument that federal money must support the carriers because of their importance in time of emergency—"an adequate logistical air arm of the National Defense Establishment."

Recommendations

Hoover Commission proposes the following changes in reference to air transportation:

- **That the technical services of MATS which duplicate those of other branches of the government be discontinued.**
- **That the Secretary of Defense issue a superseding and controlling directive to eliminate the duplicating air transport services within the Department of Defense and merge the entire operation in MATS, except necessary administrative aircraft.**
- **That the number of administrative aircraft be drastically reduced.**
- **That the peacetime operations of the integrated MATS be restricted and realistically limited to persons and cargo carefully evaluated as to necessity for military air transportation and, only after commercial carriers have been utilized to the maximum practicable extent, should transportation on service carriers be authorized.**

Odd Cargoes

In its MATS study, the commission came up with these items:

- During July 1954, 13,000 lb. of furniture was flown from Bermuda to the U. S. and in September 25,000 lb. of cement was carried the other way.
- A USAF band is flown once a month from Westover AFB Mass., to Bermuda for dances and concerts.
- A cargo of ping-pong balls has been flown from Westover to Berlin.
- A theater commander once required MATS to fly a substantial quantity of dog food from the West Coast to Okinawa.

▶**Parallel Routes**—The report cited the history of MATS, which was organized in 1948 through a merger of USAF's Air Transport Command and the Navy's Air Transport Service with the object of wiping out duplication and effecting economy.

▶**Military Charters**—Another Navy Service is a transcontinental charter activity called "Operation Quicktrans." This service cost the Navy $1.5 million in 1954 paid to charter operators leasing C-46s from the government while at least one commercial airline was unable to get the business.

In a look at another USAF operation,

the commission is critical of the Air Materiel Command's LogAir flights, designed to distribute aircraft parts and accessories.

The report notes that blank forms, publications, drawings, religious goods, athletic equipment, musical instruments, lumber and laundry equipment help make up the cargo.

The report says LogAir carried 2,100 tons of cargo in June of last year and that most if not all of its operations can be carried out by MATS.

In the field of administrative flying, the commission's task force estimated that Defense Department aircraft operating under various commands carried 1,255,000 passengers between domestic fields in 1954.

Operations

Other observations on Defense Department air transport operations:

- In 1954 the department generated almost 8 million air pasesngers, of whom 4.8 million were hitchhikers or on "leave status."
- MATS provides technical services of communication, weather information, air rescue and aeronautical chart production that duplicate those of other government agencies.
- There is a great deal of MATS "deadheading" but the service is trying to cut down on this by relocation of bases.

The Hoover Commission, known officially as the Commission on Organization of the Executive Branch of the Government, covers all forms of transportation in its report to Congress. Defense Department gets the major share of attention not only in reference to air transport, but also in sections dealing with rail and water carrier operations.

▶ **General Criticism**—Overall criticism of Defense Department transportation functions, summarized in a prelude to the recommendation that it be controlled by a single director, includes these points:

- Lack of recognition of the key importance of transportation.
- Failure to coordinate warehousing and procurement with transportation within and between the services.
- Present organization plan subordinates transportation.
- Lack of review and improvement of operating performance.
- Wide and unsupervised diffusion of technical functions.
- Too much military control.
- Inadequately trained supervisors.
- Lack of statistical and management control data.
- Poor salaries for traffic management personnel.

Lockheed Gives Up Turbopropped Connie

Lockheed Aircraft Corp. has scrapped the turboprop 1449 Super Constellation. In its place, the company plans to offer airlines its new Model 1649, basically the 1449 but powered by 3,400-hp. Wright Turbo Compound piston engines.

A projection of the 1449, however, may be built for the military. Lockheed spokesmen say the Navy is interested in its Model 1549, a stretched version of the 1449 with Pratt & Whitney Aircraft's T34 turboprops.

P&WA withdrew its engine from the civil transport when Lockheed lengthened the 1449's fuselage 108 inches after payload-and-space studies indicated the turboprop Super Connie could carry a heavier load than could be stowed under average densities. This longer version became the 1559.

Pratt & Whitney said Lockheed wanted to pull too much cruise power out of the T34 for the new model.

With no turboprop for a civil airliner, Lockheed took the extra 108 inches out of the Super Connie's fuselage and replaced the T-34s with Wright's latest turbo compound R3350-EA11.

Navy Uses Flying Lab for Radar Studies

Navy's new flying radar lab, an R5D carrying four wing-pod mounted radar sets, will be used for Naval Research Lab studies of radar and radio wave propagation. Fifteen-foot mast amidships, which can be raised and lowered in flight, houses meteorological instruments. Radar sets, which range S- to K-band, will be used to investigate back-scattering properties of different targets. Aircraft may be used also as one terminal of a one-way transmission link to investigate atmospheric scattering and "radio ducts." The latter is an atmospheric condition which provides unusually good radio transmission.

Air Defense Trying Out Missiles Armed With Atomic Warheads

U.S. Air Force and the Atomic Energy Commission are experimenting with an atomic warhead for air-to-air and ground-to-air guided missiles, designed to protect the country against enemy bombers.

First test will be held during current demonstrations in Nevada, utilizing an air-to-air missile. The weapon was not identified by AEC but presumably would be the Hughes Falcon or Douglas Sparrow, equipped with an automatic warhead.

▶ **Data for Defense**—As a preliminary, a non-nuclear device was dropped from a B-36 bomber at 30,000 ft. altitude into a pattern of trails left by 40 fighter planes. It was assumed by observers that the pattern simulated the flight path of an enemy bomber fleet.

Purpose of the test, Defense said, "will be to supplement the data needed by the Continental Air Defense Command and other interested agencies regarding the effects of atomic explosions at high altitudes."

Use of the atomic warhead was not limited to air-to-air missiles, but was mentioned as a possibility for ground-to-air weapons such as the army's Nike.

▶ **Direct Hit Unnecessary**—"Because of their great power," the announcement said "atomic air defense weapons will greatly increase our ability to repel an enemy air attack. The employment of such weapons for air defense purposes will enhance the effectiveness of interceptor aircraft squadrons and ground based air defense units in stopping enemy bombers short of our cities and other strategic targets."

Major advantage of an atomic attack at high altitude is that a direct hit is not necessary. Tremendous heat and blast of an atomic explosion would disintegrate any plane in the area.

No indication has been given of the size of the atomic missile warhead. Assuming that it can be carried by the Falcon, for example, it would give that missile power to destroy a whole squadron of bombers flying in formation without endangering the interceptor that launched the missile.

First operational interceptor to be armed with the Falcon will be the Northrop F-89H, expected to go into operation at northern outposts in the Alaskan and Northeast Air Commands (AW Mar. 21, p. 10).

Army Nike emplacements already have been installed around several domestic targets. So far, the missile has been armed with conventional warheads.

The Defense Department gave assurance that a high blast would not result in dangerous radiation on the ground.

Buying Directive Protects Weapon Developers

New protection for the weapons system development contractor is incorporated in a recent Defense Department directive ordering that price advantage alone is not the standard under which production contracts will be awarded.

The directive No. 4105.10, signed by Defense Secretary Charles E. Wilson, generally was interpreted as justification for a procurement officer to utilize a negotiated contract instead of open bidding when such a step will serve the "best interests of the government."

▶ **No Early Commitment**—Pointing out that such items as tanks, radar, guided missiles, aircraft and rockets involve complex development, evaluation and initial production, the directive says the department must keep itself free to pick the best production deal.

Factors which may have a bearing on this include:

- The development contractor may be best equipped to utilize results of his work in actual production because he developed equipment and methods in the process or because it would take substantial time and money to pass his know-how to another contractor.
- The development contractor's know-how may be essential to continued improvement of the system.
- The development contractor already has spent substantial time and money to develop the prototype.

▶ **Know-How Advantage**—The directive calls for an analysis of all factors before award of the initial production contract and adds:

"Where it is in the government's interest to award such production to a development contractor, price advantages alone should not be allowed to dictate an award elsewhere, unless a fair and reasonable price cannot be negotiated with the development contractor or unless the price advantage in award to another supplier is so substantial as to outweigh the other factors involved."

Industry reaction to the new directive generally was favorable. It was viewed as an effort to protect the development contractor and take full advantage of his know-how, which is difficult to pass on when another firm is chosen for production of a weapons system.

J47 Order Cut

Orders for more than 1,500 General Electric J47-GE-25 engines for the Boeing B-47 bomber were cancelled by the Air Force because of increased engine life.

Allowable operating time before overhaul is now 1,200 hr. GE expects some reduction in employment at its Evandale, Ohio, plant on a graduated scale.

More than 35,000 J47s have been delivered to the Air Force. "Jet engine production at the GE Evandale plant will continue," USAF said, "as new and larger engines are developed."

RAF Ordering Gnats, Carrier Model Offered

(McGraw-Hill World News)

London—With the Royal Air Force decision to "give the Gnat a try," negotiations now are under way between Britain's Ministry of Supply and Folland Aircraft, Ltd., on how many lightweight fighters to order. Talks concern a development batch of about a dozen aircraft.

RAF's approval of the Gnat came shortly after Undersecretary for Air George Ward said the Ministry had no interest in the small plane.

▶ **Potential Customers**—RAF's order should help Folland in its efforts to sell the Gnat to other countries. Two potential customers are the Indian Air Force and Royal Canadian Navy.

W. E. W. Petter, Gnat designer, and Group Capt. S. O. Tudor left for India recently to discuss the fighter.

But Folland's high-performance Gnat does not have a clear field in India. Dassault of France also is bidding for IAF's order with its entry in the North Atlantic Treaty organization's lightweight fighter competition.

In Canada, RCN has received a design study of a carrier-based version of the Gnat. Work also is proceding on finding how much arresting gear would have to be altered aboard aircraft carriers for the light fighter.

▶ **Production Models**—Two production Gnats, powered by Bristol Aeroplane Co.'s Orpheus turbojet, are under construction. They are expected to roll out in time for the Society of British Aircraft Constructors' flying display this year at Farnborough.

Prototype Midge, powered by a 1,640-lb.-thrust Armstrong-Siddeley Viper, appeared in the show last year.

With the 4,800-lb.-thrust Orpheus plus an afterburner, Folland's Gnat is expected to reach speeds up to Mach 1.2.

USAF Seeks More Efficient Management

A double-pronged effort to put U.S. Air Force on an efficient business basis, most advanced of its type in U.S. military history, is under way at the office of Lt. Gen. Charles B. Stone III, Deputy Chief of Staff (Comptroller).

The program is patterned after systems used successfully by industry, concentrating on men and money:

• **A financial value** is fixed on every item and manpower expenditure. It will be used to cut costs and improve budgetary planning.

• **USAF executive development** program is a training course, a series of lectures by both military and outside business executives, all related to the comptroller's problems and financial management. Groups ranging from 50 to 90 key personnel are taking part in the program.

General Stone sees little difference between the professional USAF pilot and other officers who are concerned with management and housekeeping chores of the military organization.

▶ **Planning Work**—"I maintain," he told AVIATION WEEK, "that to even start being successful in his job, the military commander must know and understand the expected basic achievement of the unit to which he is assigned and the standards and schedules for accomplishing it." He feels that the supervisory officer must plan his work just as meticulously as the pilot who lays out a flight plan and makes sure he will reach his destination with fuel left in the tank.

He is critical of military business practices in the past, pointing out that the inventory of supplies has turned over too slowly, and he sees the cure in an adequate financial management plan.

General Stone points out that total USAF assets are about $63 billion and inventory is about $9 billion.

"It is impossible to know what goes on in a business this size," he says, "unless you have financial summaries putting a price tag on every item and every service." He can prove that this is possibly the most important part of the Air Force operation.

"Only 4% of our people are actually engaged in duties directly related to flying and of these, only 3% at any one time are in combat crews or in combat crew training. The rest of us, 96% are in a support job of one kind or another, and we should somehow account for what we are doing to be sure that we are producing the most end product possible," General Stone said.

▶ **Operational Benefits**—He lists some of the benefits that can be expected at USAF operating bases:

• An accurate computation and portrayal of people and things needed to accomplish a mission. This is made possible by reducing them all to a common denominator—the dollar.

• An accurate measure of the cost of accomplishing the mission. This is something foreign to traditional military operations.

• A yardstick that will identify the best producers, tag the poor producers and show where improvements must be made.

• Encouragement of scheduling and programming of work to avoid the peaks and valleys common to most military operations.

• Cost information will permit diversion of more resources from support activity to the mission itself.

• Fewer and more simple reports to reduce the administrative load.

• More intelligent procurement.

General Stone feels strongly that the program of putting a price on everything a USAF command uses and every mission it performs will reduce waste.

LT. GEN. STONE

▶ **Budget Improvement**—Former military fiscal systems, General Stone points out, always have emphasized obligations and disbursements. Under the new USAF system stress is put on accruals and expense, leaving the record to show who used manpower and supplies and for what purpose.

Under the Financial Management System each USAF base will prepare budget, showing what is on hand and what is needed to do the job.

Adapting the Financial Management System, General Stone says, is a good deal like the conversion to a new weapons system. Professional advisors have been engaged to show how real business methods can be utilized in a non-profit military operation.

▶ **Educational Program**—First tests were conducted at McChord AFB, Wash., Lockbourne AFB, Ohio, and Langley AFB, Va. The system now is being applied to all USAF operations.

Hand-in-hand with this program to put the Air Force on a professional basis, the comptroller's office is conducting an educational program to improve officer competency.

General Stone believes that the use of other people's money cannot be entrusted to executives who fail to understand what his office is trying to do to cut expenses and improve efficiency.

Because 90% of USAF's resources are used at base level, he feels it is vital that the men who are responsible for administration know as much as possible about both USAF and business accounting methods.

Estimate of Aviation Gasoline Consumption 1954-1960

(IN THOUSANDS OF BARRELS PER DAY)

	1954*	1955	1956	1957	1958	1959	1960
U.S. Military Jet Fuels	117	184	210	283	301	309	324
U.S. Military Aviation Gasoline	118	124	119	111	107	102	100
U.S. Civilian Aviation Gasoline	74	79	83	86	88	91	94
Foreign Exports of U.S. Aviation Gasoline	84	92	95	100	102	105	108
Total Military Consumption of All Types of Aviation Fuels	235	308	329	394	408	411	424
Total Consumption of Aviation Gasoline (excluding jet fuels)	276	295	297	297	297	298	302
Total Consumption of Aviation Fuels (all categories)	393	479	507	580	598	607	626

* Known, rather than estimated, figures.
Source: American Petroleum Institute. Figures obtained by API from Petroleum Logistics Division, office of the Assistant Secretary of Defense.

Republic, Fairchild Profit Rates Higher

Annual reports for 1954 have been issued by Republic Aviation Corp., Fairchild Engine & Airplane Corp., Temco Aircraft Corp., and Jack & Heintz, Inc., component manufacturers.

Republic

Republic Aviation Corp., Farmingdale, L. I., New York, report net earnings of $8,967,523 on sales of $323,456,601 compared with $8,314,301 on sales of $411,801,885 in 1953.

End of the excess profits tax was credited by President Mundy I. Peale as chiefly responsible for the higher ratio of earnings to sales. In 1954 these amounted to $6.71 per share after a 10% stock dividend granted last December.

At the close of 1954 the company's backlog was $950 million, down from the previous year's $1 billion.

▶ **Engine Problem**—Included in the backlog are unfilled orders for the F-84F, the F-105 and the experimental XF-103. Latter planes are nearing flight stage along with the XF-84H.

Peale said that 1954 production difficulties with the F-84-F were due to problems involving development of the Curtiss-Wright version of the Sapphire jet engine, which resulted in airframes being held up to the point where production had to be curtailed and 7,000 employees were released. He said major difficulties are passed and operations now are normal.

Other highlights from the Republic report:

- About 424,000 sq. ft. of space will be added in 1955 with acquisition of a Fairchild Engine & Airplane Corp., plant at Farmingdale.
- The Guided Missile Division of Republic has moved from a preliminary design and study phase into research and development activity. Two government contracts were completed in 1954. New contracts dealing with guidance systems and weapons design and analysis are being prepared. New equipment is being installed for production of prototypes.

Fairchild

Fairchild Engine & Airplane Corp., Hagerstown, Md., reported net earnings of $4,134,015 in 1954 compared with $4,013,541 the previous year. Sales were $140,428,318, down from $170,135,266 in 1953.

Other highlights from the report:

- About $2,700,000 was invested in expanded research and development programs during the year.
- Two new divisions were added—Kinetics and American Helicopter Co. Latter is concentrating on advanced designs since cancelation of the XH-26 pulse-jet project and widening its interests to cover new manufacturing processes. These include a metallurgical development for application to aircraft and missiles subject to thermal barrier problems and stainless steel honeycomb.
- New plant of the Engine Division at Deer Park, Long Island, will go into operation next fall. It will provide 400,000 sq. ft. of space.
- Production of the C-119 will continue through 1955, phasing out as C-123B production increases.
- Windtunnel tests will be started soon on a new jet transport design and the prototype may fly by spring of 1957.
- $1 million expenditure has been authorized for work on boundary layer control.
- Work is progressing on miniature submarine and trials will start this year.
- Guided Missiles Division has added 40% to its personnel and production on existing contracts will last into 1956. The division has designed a new type of shipboard radar.
- Unfilled orders at end of 1954 totalled $246 million, down from $321 million.

Temco

Record net earnings of $2,937,249 were reported in 1954 by Temco Aircraft Corp., Dallas, Tex., credited in large part to the company's effective program of diversification.

The year's earnings, equal to $1.75 a share marked a 10.1% increase over 1953, the previous record year. Gross sales for 1954 were $59,209,419, compared to $72,130,910 for 1953. The difference was due, according to President Robert McCulloch, to $15 million in termination claims in 1953.

While production was devoted in large part to major components for aircraft built by Boeing, Lockheed, McDonnell and Republic, Temco's engineering division was reorganized on a weapons system basis. The company expects new strikes in the fields of electronics, aircraft design and utilization of new materials.

Jack & Heintz

Jack & Heintz, Inc., Cleveland, Ohio, aircraft component manufacturers, had a net income after taxes of $1,803,460 in 1954, largest in the company's history except for 1951.

Last year's sales were $33,361,860, down from the 1953 figure of $40,118,237. The fact that earnings increased by 29% in the face of this cut in sales was attributed to the end of the excess profits tax.

Jack & Heintz backlog at the end of the year was estimated at $25 million, enough to keep the firm busy for 9 months.

The annual report pointed out that research and development expenditures last year came to $3,750,000. Because of the nature of modern aircraft components, it is expected that the expansion will continue in 1955.

"More and more the developments which we must undertake are for highly engineered devices for specific application in a particular plane or guided missile, rather than for less specialized products having wide application in many end-use items," the report said.

"This is the nature of the business as it is today and doubtless will be in view of the increasing complexity of the electric equipment of the new planes. Many of these developments are such that 3 to 5 years are required for their successful completion."

Automatic Carrier Landing

Navy soon will begin fleet operational tests on a new landing system capable of bringing aircraft aboard carriers for hands-off landings.

Developed by Bell Aircraft Corp. (AW Dec. 27, p. 43), the Automatic Carrier Landing System has completed trials at a Navy facility under weather conditions that normally would ground fleet aircraft.

Bell says the accuracy of its new unit indicates it also could be used as an all-weather landing aid for other military and civil aircraft.

ACLS is a combination radio-radar unit, according to Bell. Radar locates the aircraft and determines its altitude and position in relation to the carrier deck.

An electronic computer calculates speed and direction, compares the plane's position with what it should be and determines the necessary course. This information is fed into a radio transmitter, which directs the aircraft into the flight pattern.

The computer also calculates the speed of the aircraft carrier, its position and pitch and roll of the deck at the instant the plane will touch down.

If the landing approach is wrong, Bell says, the device will give the plane a wave off and send it around for another try.

ORENDA . . . *a new power in the Jet Age!*

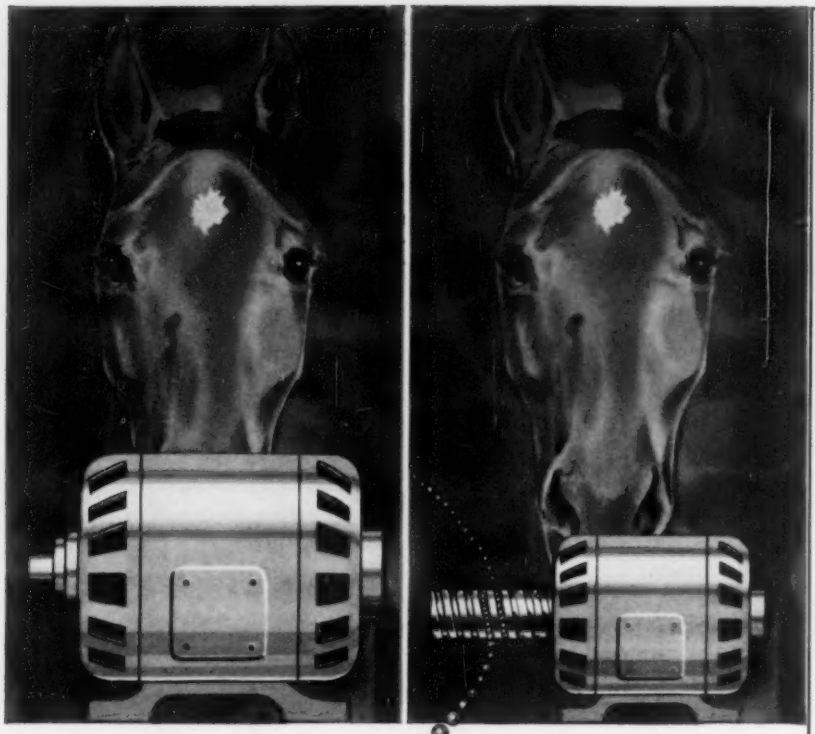
From Orenda's design, development and production departments came the first all-Canadian jet engine to power the CF-100 and F-86 Sabres V and VI. Expanded research facilities are now under construction to deal with the increasingly complex requirements of the future.

The 6,000 people in the Orenda family are dedicated to designing, manufacturing, maintaining and servicing modern jet engines and other forms of aero power and to the building of a sound aircraft industry for the defence and development of Canada.

*ORENDA: Source of all power *Iroquois*

ORENDA *ENGINES LIMITED*
MALTON, CANADA

DEDICATED TO CANADA'S JETPOWERED LEADERSHIP IN THE AIR



THE SAME SIZE HORSE

from half the motor

PLUS THIS SCREW **THAT ROLLS ON BALLS**

Replace the common high-sliding-friction screw with an AEROL Ball-Screw mechanism, and you can double drive efficiency. Because this mechanism moves on a friction-less stream of steel balls, it eliminates the dead loss of friction. This means you can use a 1-horsepower motor where a 2-horse was formerly needed... a 5-horse where 10 was called for, allowing you to save on motor size and weight, first cost, space and electricity required.

Because AEROL Ball-Screws move entirely on steel balls, they provide two additional advantages. They eliminate the need for lubrication, letting you operate in extremely high temperatures without fear of fire, and in extremely low temperatures without problems of sluggish operation. They make possible fast, precise, continuous positioning down to *near-zero* tolerance.

These AEROL Ball-Screws are at work now on aircraft, on trucks and cars, on machine tools, on standard and special equipment of all kinds.

AEROL Ball Screws may be able to solve a problem for you. To get more information, write for our free booklet.

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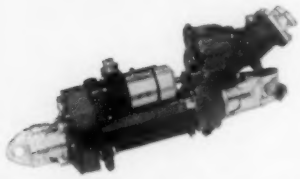
AIRCRAFT GROUND HANDLING EQUIPMENT

WORLD'S LARGEST MANUFACTURER OF AIRCRAFT LANDING GEARS

Cleveland Pneumatic Products Now at Work on Aircraft



Flight control actuator, used on the Grumman F9F8 Navy Fighter, consists of a ball screw driven by a 14-H.P. hydraulic motor, with the nut driven by a 1-H.P. electric motor. Peak operating load is 12,000 lbs.

This ball-screw mechanism 28½" long raises and lowers the nose wheels on the Goodyear ZP2N blimp. Powered by an ⅛-horsepower motor, it operates at tension loads of 4200 to 5040 pounds.

Designed to be flash-butt-welded from three components, this C-124 landing-gear strut cylinder is resistance welded on Cleveland Pneumatic's 1,000,000-pound upset, 4,000,000-volt-ampere welding machine.

Titanium is readily machined—turned, milled, honed, threaded, drilled, tapped—at Cleveland Pneumatic to make this prototype landing-gear strut cylinder for experimental tests.

Capital Traffic Cure Stirs Fight

Recommendations for relief of the air traffic jam at Washington National Airport, issued by a Presidential Advisory Committee, include use of Baltimore's Friendship International Airport, but leave the long term problem unsolved.

Last year, President Eisenhower appointed a committee composed of Rowland R. Hughes, Budget Bureau Director; Sinclair Weeks, Secretary of Commerce, and Harold E. Talbott, Secretary of the Air Force, to make recommendations.

The committee's report finds that:

- The government should expand facilities at National Airport and take other steps to relieve congestion.
- Friendship Airport should be used to supplement National Airport.
- Local citizens should decide on a solution and get together with the airlines and the government for joint financing of the project.

The action ends any hope for an immediate permanent solution.

▶ **Burke Project**—The need for a second airport for Washington has been obvious for a long time. Several years ago, the government started buying land for a field at Burke, Va., south of Washington. Local pressure and a determined campaign by Maryland groups in favor of Friendship just about killed the Burke project.

Use of Friendship has been a sore point in the controversy. Maryland congressional leaders feel that the field is close enough to be feasible as an alternate terminal. Local groups and the airlines don't think so, and strong objections to the committee recommendations have arisen.

Airlines feel Washington is, to a large extent, a short-haul market. They believe the extra time consumed in getting to the Baltimore airport will destroy the advantage of flying.

▶ **Butler Asks Action**—Maryland leaders say that long-haul traffic could be diverted to Friendship with little trouble since passengers on such flights are not particularly concerned with a little added terminal time.

Sen. John M. Butler has asked the Civil Aeronautics Board to take formal action to designate Baltimore an alternate terminal for Washington.

Friendship Airport never has operated at anything close to capacity. It is considered a model field from an operational standpoint; airlines object that it simply isn't convenient enough to serve Washington.

▶ **Hindrance, Not Help**—The committee's recommendation that local groups get together with the airlines and the government in constructing a new Washington airport is viewed in the capital as more of a hindrance than a help. The project would involve agreement between Virginia, Maryland and the District of Columbia on site, financing and other factors. Possibilities of early agreement is considered remote.

According to the committee, the airport should be financed "in the same manner as in all other civilian airport construction in the continental United States—i.e., by the affected communities and the air transport industry." Special factors in the Washington situation complicate this concept.

The District of Columbia has no vote, and thus little opportunity to express its opinion and make its wishes felt. Any funds to be spent by the D. C. government must be approved by Congress. So the District of Columbia isn't able to manage its affairs and build airports as independently as other municipalities.

▶ **Lack of Funds**—The crux of the committee report appears to be that there are currently no federal funds available to build a second Washington airport. The solutions offered will be helpful, but they don't touch on the basic issue of where and when the second airport will be built.

Various steps are recommended for relief of the congestion at National Airport. A request for funds is being drawn up and, if Congress approves it, work might get under way this summer.

The report asks for expansion of gate positions, parking, baggage handling, fueling and other facilities, improvement of runway and taxiway lighting and an additional hangar.

Other recommendations for National:

- Adjust operations at neighboring Bolling AFB and Anacostia Naval Air Station to relieve airspace conditions during heavy weather.
- Relieve National of all government traffic but that of the highest rank and urgency.
- Develop long-range plans to determine the feasibility of relocating all Bolling and Anacostia activities.
- Designate a high density control zone in the Washington terminal area.
- Improve cooperation of all affected branches of government with civil aviation in every way possible without impairment of essential military and vital government operations.

New Ford Tri-Motor Nearing Completion

Bellflower, Calif.—Prototype of a modernized Ford Tri-Motor is nearing completion at Hayden Aircraft Corp., organized here to build a new version of the 29-year-old all-metal transport. The new model will be called the Stout Bushmaster.

Designers claim the plane, intended for bush country operation, will have shortest takeoff and landing distance, fastest climbing rate and biggest payload per gross weight of any transport flying.

▶ **Freight Transport**—Formation of the

Military Aviation Obligations

Contract cancelation for aircraft and related procurement exceeded new orders during January with the result that the three military services had over $120 million more on hand in unobligated funds at the end of the month than at the beginning.

NET OBLIGATIONS

(In Thousands)

	January Obligations	Unobligated Balance Feb. 1
Aircraft		
Air Force	$24,046	$5,153,560
Navy	—144,097	1,181,430
Army	— 1,925	116,041
Total	—121,976	6,451,031
Guided Missiles		
Air Force	105,177	476,433
Navy	13,676	115,199
Army	11,813	147,013
Total	130,666	738,645
Electronics and Communication Equipment		
Air Force	19,654	673,538
Navy	2,938	96,864
Army	3,941	141,199
Total	26,533	911,601

new company followed an announcement in December 1946 of plans to revive production of the Tri-Motor (AW Dec. 28, 1953; May 17, 1954, p. 18), first certificated in 1926.

Initial incorporators include designer William B. Stout and Robert E. Hayden, president of the new firm. The corporation plans to issue public stock.

"The 1955 version will be a simple grass-runway freight airplane for high lift, short takeoff and landing, and without any more gadgets than are necessary for contact flying in undeveloped regions . . ." Stout says.

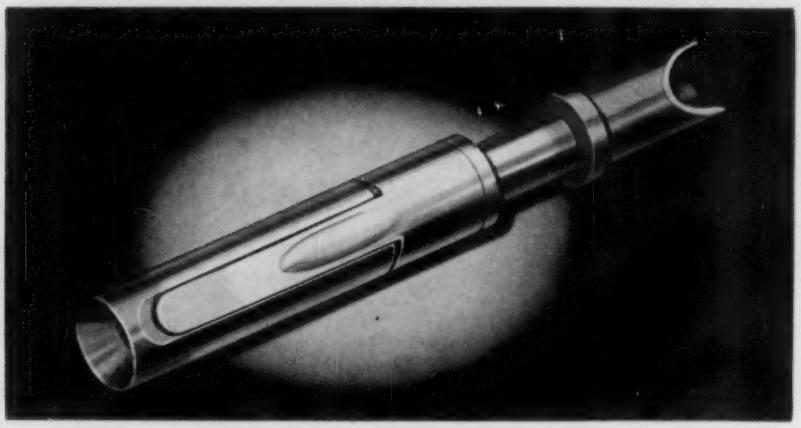
The fundamental purpose of this type of plane is not speed but usefulness and earning capacity, with the first price to the customer kept to an absolute minimum. No such ship exists today except some of the (30) old Fords still in the air."

► **Tri-Motor Changes**—The Stout Bushmaster has been designed to use minimum tooling and with only as much instrumentation and equipment as necessary for contact flying. All extras will be optional, including those for equipping it as a seaplane.

The principal changes in the new version include: widening of the fuselage by 18 in.; more powerful and lighter engines, possibly Pratt & Whitney R985s with cowling for better engine temperature control; modernization of cockpit; addition of wing flaps; installation of hydraulic struts on the landing gear; rerouting of control cables internally; transfer of engine instruments to the pilot's panel; addition of a large cargo door; strengthening of floor for concentrated loads, and improved vertical tail.

With these changes, the company says its transport will have a gross weight of 12,500 lb. and be able to lift a payload of 5,000 lb. It will have a range of 525 mi., a cruise speed of 125 mph., and a stalling speed of 40 mph.

Climb performance at sea level will be 2,000 fpm.



"CLIP-TYPE" closed entry socket contact now standard in

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ELECTRICAL CONNECTORS

Cannot be overstressed—eliminates intermittent circuit problems resulting from socket contact malfunction.

The heart of any electrical connector is the socket contact. This is why the Bendix-Scinflex* socket contacts have always been machined from bar stock. Stampings, with their required thin sections, can be easily overstressed.

Even with the machined sockets, industry has been plagued with overstressed spring leaves due principally to the misuse of test probes and lax tolerances on pin contacts. Bendix engineers have now provided the only socket contact on the market today which completely eliminates all these problems.

The "Clip-Type" socket will not accept any oversize probe or pin, nor can one be forced into it. Also, no amount of wrenching or twisting of an acceptable pin or probe can possibly distort the spring clip. This new socket is now standard in all Scinflex connectors including those using solderless, high-temperature and thermocouple contacts.

Our sales department will be glad to furnish complete information on request.

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MATS Chief Reports On Turboprop Trials

The first 150 hr. of experimental operation of Military Air Transport Service's two turboprop Convair YC-131C transports has uncovered a number of vibration and engine problems.

Lt. Gen. Joseph Smith, MATS commander, recently told the Wings Club in New York that the planes are given periodic dye tests to discover incipient cracks and failures. The oil tanks have been remade of heavier gage metal to reduce cracking.

► **Engine Report**—The planes, each powered by two Allison YT56s, have experienced rough starts. The only fix for this condition is to shut down and restart.

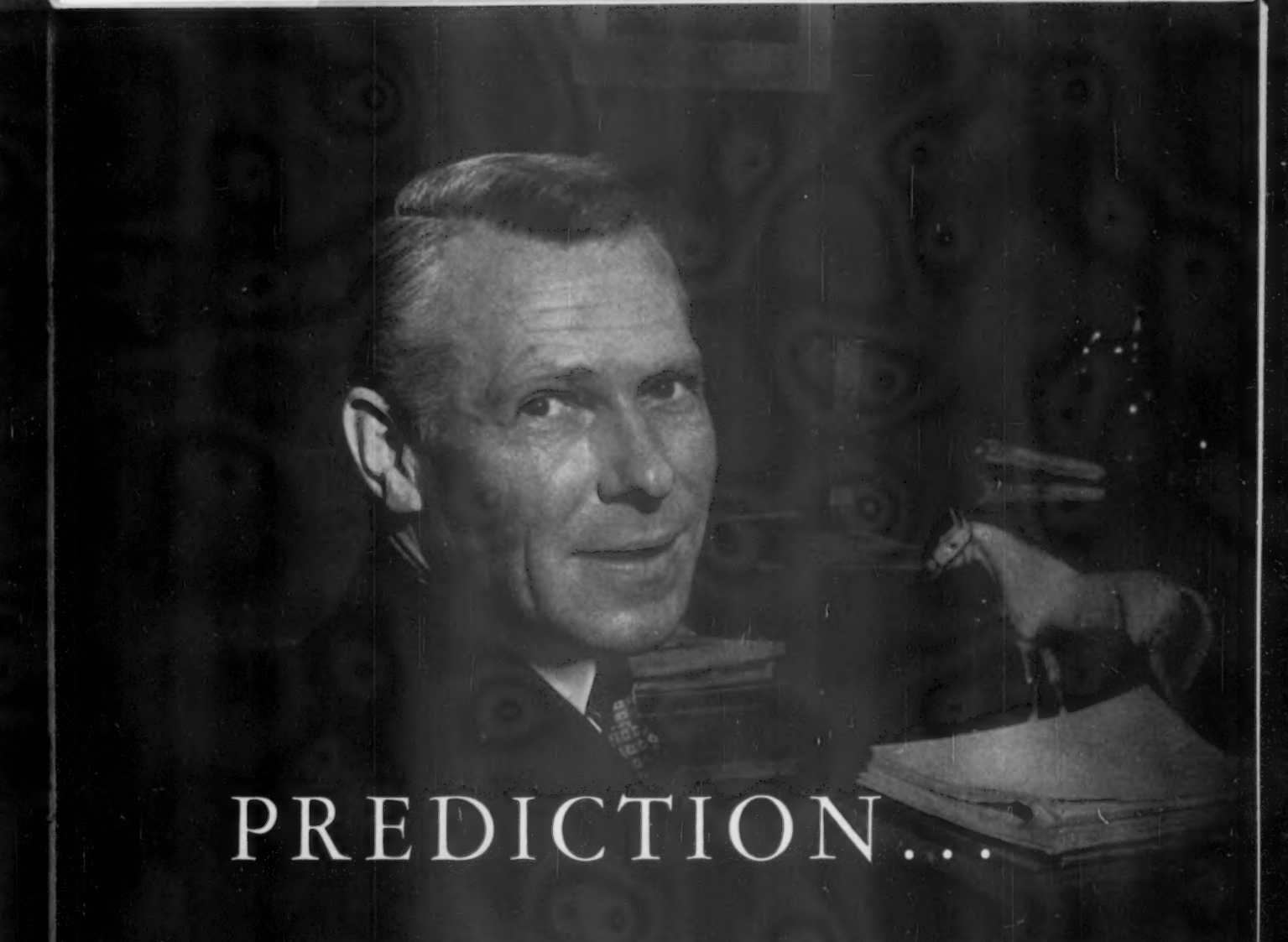
MATS is now negotiating with the Air Staff for 12 production units of the T56, on which Smith expects roughness will be eliminated. MATS has eight YT56s at present.

Utilization of each Convair by MATS' turboprop program test squadron, based at Kelly AFB, Tex., is only 2 hr. a day, compared with MATS' fleetwide utilization of 4 hr. This limit is imposed by the 100-hr. rating on the engines and by Allison's ability to inspect and overhaul the engines—it takes 90 days at present.

Only one serious YC-131C incident has occurred thus far. Icing in the air intake screens caused one forced landing. Temporary fix: Removal of the air screen. The two Convairs are not all-weather ships. Air intake screens are not heated or retractable. No provision is made for wing or prop de-icing. They will be so equipped by fall, said Gen. Smith.

The planes are flown at 20-25,000 ft., rather than optimum altitude of 30,000 ft., because of pressurization limits. Operated at 280 knots true airspeed, they have shown a consumption of 280 gal./hr. at 80% power.

The turboprop squadron is running



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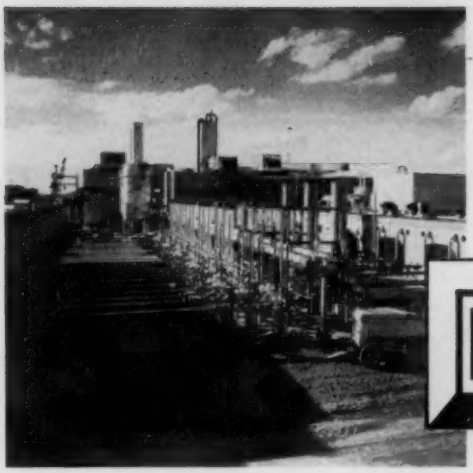
Once you've flown the Viscount — world's first turbo-prop airliner — you'll never want to travel any other way. Its four powerful Rolls-Royce engines make the Vistount exceptionally fast and pleasantly free from disturbing noise and vibration.

The Viscount will be serving Capital cities soon. Be among the first to enjoy this new concept in flight.

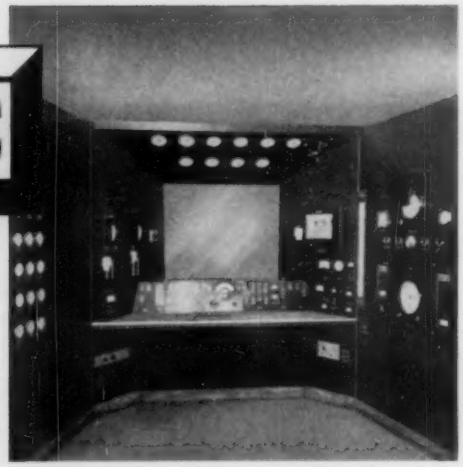
Powered by ROLLS-ROYCE

Capital AIRLINES

proving the mettle of aircraft components



PARSONS



Facilities for production-testing aircraft components under simulated flight conditions are being architect-engineered and completely instrumented by The Ralph M. Parsons Company.

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test pattern routes now, one between Kelly and Travis AFB, Calif., the other between Kelly and Andrews AFB, Md. Squadron has 21 officers and 100 men.

► **New Ship**—Smith reported that Douglas has now racked up 70 hr. of Phase I testing with the YC-124B, and the plane should soon be ready for Phase II.

By December, MATS hopes to get its two Lockheed YC-121F Super Connies and two Boeing YC-97Js, each powered by four Pratt & Whitney T34 turboprop engines. Smith expects the service to gain valuable experience with the turboprops against the day that the Douglas C-133 turboprop transport comes into service. For cargo transport, Smith favors the turboprop powerplant, but he views the possibility of the ducted fan with interest. For passenger service, he favors the jet transport.

► **Reactivation**—MATS' reactivation and conversion program has been running in high gear for the last year and will continue for the next 18 months. Eighteen transport squadrons have been reactiviated or converted since the program began, and 100 heavy transports have been absorbed in the 1,500-plane fleet.

Since the move of headquarters to McGuire AFB, N. J., from Westover AFB, MATS has concentrated at the new headquarters probably the largest fleet of over-ocean transports ever assembled at one location.

CAB to Air Inspection Proposal at Meeting

Civil Aeronautics Board's proposed elimination of annual inspection of general aircraft will be explored further at a public meeting in Washington Apr. 13.

The Board's purpose in amending the regulations is "to place more responsibility on industry for the continued airworthiness of such aircraft."

CAB said its action in setting up a meeting under the Bureau of Safety Regulation is in response to numerous requests for a public discussion of planned changes in procedure. After the proposal was announced Dec. 30, general aviation operators indicated acceptance of the Board's objective but raised opposition to certain requirements.

As a consequence, CAB suggested the open meeting be limited to discussion in the areas of disagreement, which include:

• **Periodic inspection.** The mandatory 100-hr. inspection proposal may be made more flexible. An alternative would be periodic inspection at times consistent with type of operation but with a minimum of one annually.

• **Progressive inspection.** Restriction of progressive inspection to certificated repair stations could be lifted. An alternate proposal would be to permit progressive inspection elsewhere.

• **Mechanics' proficiency.** Proposed regulation would require an authorized mechanic to make a minimum of two aircraft inspections a month. Other means will be discussed to insure a mechanic's continuing proficiency.

Colombia Civil Fleet Up 30% in Year

(McGraw-Hill World News)

Bogota—The number of commercial planes registered in Colombia by the end of 1954 had increased 30% to 336, from 1953's registration of 258.

Despite these additional transports, cargo requirements in December were so heavy Avianca had to charter two Pan American DC-4s during the month. The Civil Aeronautics Board of Colombia has already authorized the import of 48 more planes.

Other new developments:

• **Lloyd Aereo Colombiano,** a new airline, started operations Dec. 30.

• **First commercial helicopter** company in Colombia started operations: Petrolcum Bell Co.

• **Extensive pilot training** program is being started by the Civil Aeronautics Board. Outlay is $2,800 a pilot.

• **Training school for copter** pilots and gliders will be opened this year.

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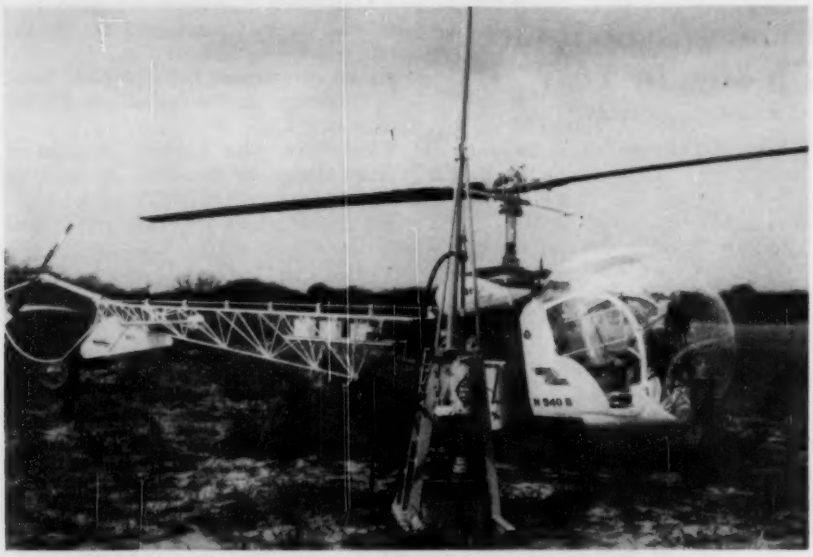

UTILITY COPTER is being used by Bell to test out uranium-hunting techniques.

To prove the business value of its utility helicopter as a tool for fast-moving, wide-ranging uranium prospectors and to expand its market, Bell Aircraft Corp. has established the Bell Exploration and Development Corp. The new subsidiary will:

- Field-test a variety of air-transportable mechanical and scientific equipment used in modern uranium exploration.
- Develop, evaluate and incorporate any refinements uncovered during actual operation that will broaden the effectiveness of the basic Model 47 design.

Bell is paying the costs of proving this helicopter-equipment team because the firm believes that such research is often priced beyond the reach of individual potential customers and the manufacturer must assume this cost to develop his markets.

Harvey Gaylord, vice president of the parent company's Helicopter Division, is president and Arthur L. Fornoff is general manager of the new group. Offices are at Ft. Worth, Tex., and Glendale, Calif.

"We are field-testing the helicopter and special equipment installations in order to determine exactly what is needed by the fast-moving uranium industry," Gaylord explains. "Based on our experiences in this field," he states, "we will be able to determine and produce a helicopter of unlimited utility for uranium prospectors and producers, and for the many commercial helicopter operators using our machines.

▶ **Demonstrator Tour**—The Bell subsidiary has a standard Model 47G, fitted with a variety of mining and prospecting devices, touring the Southwest. The package display includes a 100-lb. scintillometer for measuring and recording radioactivity emanating from the earth. A 300-lb. diamond core drill is carried disassembled on the copter's skid landing gear cross tubes.

A large fleet of company-owned and chartered fixed-wing lightplanes has been active in prospecting in the Southwest since the early days of the "Uranium Rush," which has mushroomed as demand for the critical material increased.

Helicopters are also active in this area. Anaconda Copper Mining Co., a major uranium producer and a 47G user, credits aerial surveys with discovery of its multi-million-ton ore find in New Mexico, Bell states.

Field geologists have cut one- and two-day surface trips to half a day, using copters. Important ore samples and instrument readings can be checked at field offices within hours and appropriate action taken quickly. Also, the copter can get men and materials quickly to otherwise inaccessible spots.

PROSPECTOR checks scintillometer graph reading after copter survey flight.

▶ **Repeat Venture**—Bell previously had organized a subsidiary to prove the value of the helicopter in business and develop a potential market. One was organized to study the copter's potentialities in petroleum geophysical surveys shortly after the model 47 received its Type Certificate in 1946.

After selling the petroleum industry on the copter, the company dissolved the subsidiary. There are now more than a dozen helicopter charter operators leasing Bell machines to oil companies all over the world and two oil companies also own 47Gs, the firm says.

Automatic Off-Course Navaid for Learstar

First business plane to incorporate an automatic off-course navigation system tied into an autopilot has been sold by Lear Aircraft Engineering Division to British American Oil Co., Ltd., Toronto, Canada. The installation is also the first purchased by any commercial operator.

The new integrated Collins Radio NC-101 off-course computer and Lear L-5 autopilot enables the Learstar to be flown automatically to any off-airways destination or waypoint within range of two VOR stations. System also provides the crew with information on the distance to the destination or waypoint without need for DME equipment.

Added feature of the Collins system is a punch-card device which automatically tunes the VOR receivers to selected stations en route and sets in required data to the navigation computer (AW Dec. 15, 1952, p. 41).

Certificated in the airline transport category, the Learstar is a much-modified Lockheed Lodestar, seating up to 12 passengers plus a crew of two. Lear reports that schedules call for two deliveries monthly. Among those who have placed orders are Chance Vought Aircraft, Inc., Johnson & Johnson, Burroughs Corp., and Charles B. Wrightsman.

Lightplane Exports

February exports of U. S. civil planes weighing 6,000 lb. and less totaled 45 units valued at $458,571, Aircraft Industries Assn. reported recently.

This latest total brings to 90 the number of planes exported in the first two months of 1955. Value of these shipments was $848,990.

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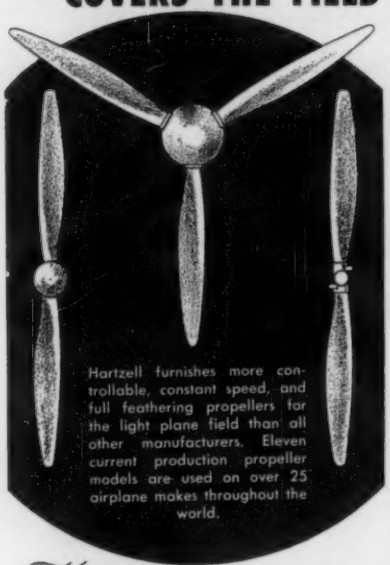
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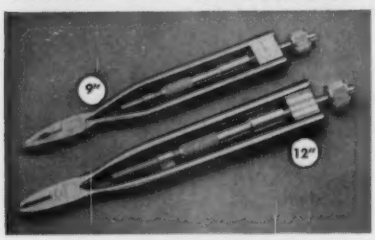

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SEC Reports Aviation Stock Deals

Disposal of 18,000 common shares of Bellanca Aircraft Corp. stock by G. M. Bellanca, a director, leaving a holding of 600 shares, is reported in Security and Exchange Commission's latest transaction summary.

Other transactions reported for the mid-January to mid-February period:

Aero Supply Manufacturing Co.: Disposal of 1,400 common shares by Henry Margolis, director, leaving a holding of 16,300 shares.

Alaska Airlines. Acquisition of 3,500 common shares by Frank C. LaGrange, director making a holding of 6,400.

American Airlines. Acquisition of 100 common shares by J. W. Farley, director, making a total holding of 300, and these acquisitions through exercises of options: 500 common shares by W. Nelson Bump, officer, making a holding of 1,500; 1,750 common shares, total holding, by George C. Van Nostrand, officer; and 2,000 common shares by Marvin Whitlock, officer, making a total holding of 2,500.

Bell Aircraft Corp. Disposal of 5,500 common shares by Ray P. Whitman, officer and director, making a total holding of 13,000.

Bendix Aviation Corp. Acquisition of 300 common shares by W. H. Houghton, officer, making a holding of 1,135.

Braniff Airways. Acquisition of 1,000 common shares by William Blakely, director, making a holding of 64,605; acquisition of 400 common shares by Eugene C. Eppley, director, making a holding of 6,500; disposal of 1,000 common shares by Thomas F. Ryan III, director, leaving a holding of 41,500.

Capital Airlines. Acquisition of 861 common shares through exercise of an option by Raymond G. Lochiel, officer, making a holding of 8,211; acquisition of $12,000 debentures by James W. Austin, officer, making a holding of $14,000.

Cessna Aircraft Co. Disposal of 1,500 common shares by Dwane L. Wallace, president, leaving a holding of 65,550.

Colonial Airlines. Disposal of 500 common shares by Joseph Shields, director, leaving a holding of 1,000.

Eastern Air Lines. Acquisition of 100 common shares by Charles Froesch, officer, making a holding of 1,205; acquisition of 200 common shares by Stuyvesant Peabody, Jr., director, making a holding of 500.

Emerson Electric Manufacturing Co. Acquisition of 3,500 common shares by Mills, Inc., beneficial owner, making a holding of 86,500.

Fairchild Engine and Airplane Corp. Acquisition of 100 common shares by A. F. Flood, officer and director, making a holding of 1,350.

Flying Tiger Line. Acquisition of $2,000 debentures by Robert Prescott, officer and director, making a holding of $132,000.

B. F. Goodrich Co. Disposal of 2,600 common shares by John L. Collyer, director, leaving a holding of 44,108; disposal of 250 common shares by H. V. Gaertner, officer, leaving a holding of 4,950; disposal of 400 common shares by E. A. Stevens, officer, leaving a holding of 4,900.

Goodyear Tire and Rubber. Acquisition through exercise of option of 5,190 common shares by H. L. Hyde, officer and director, making a holding of 9,482; disposal of 3,000 common by P. E. H. Leroy, officer and director, leaving a holding of 10,010.

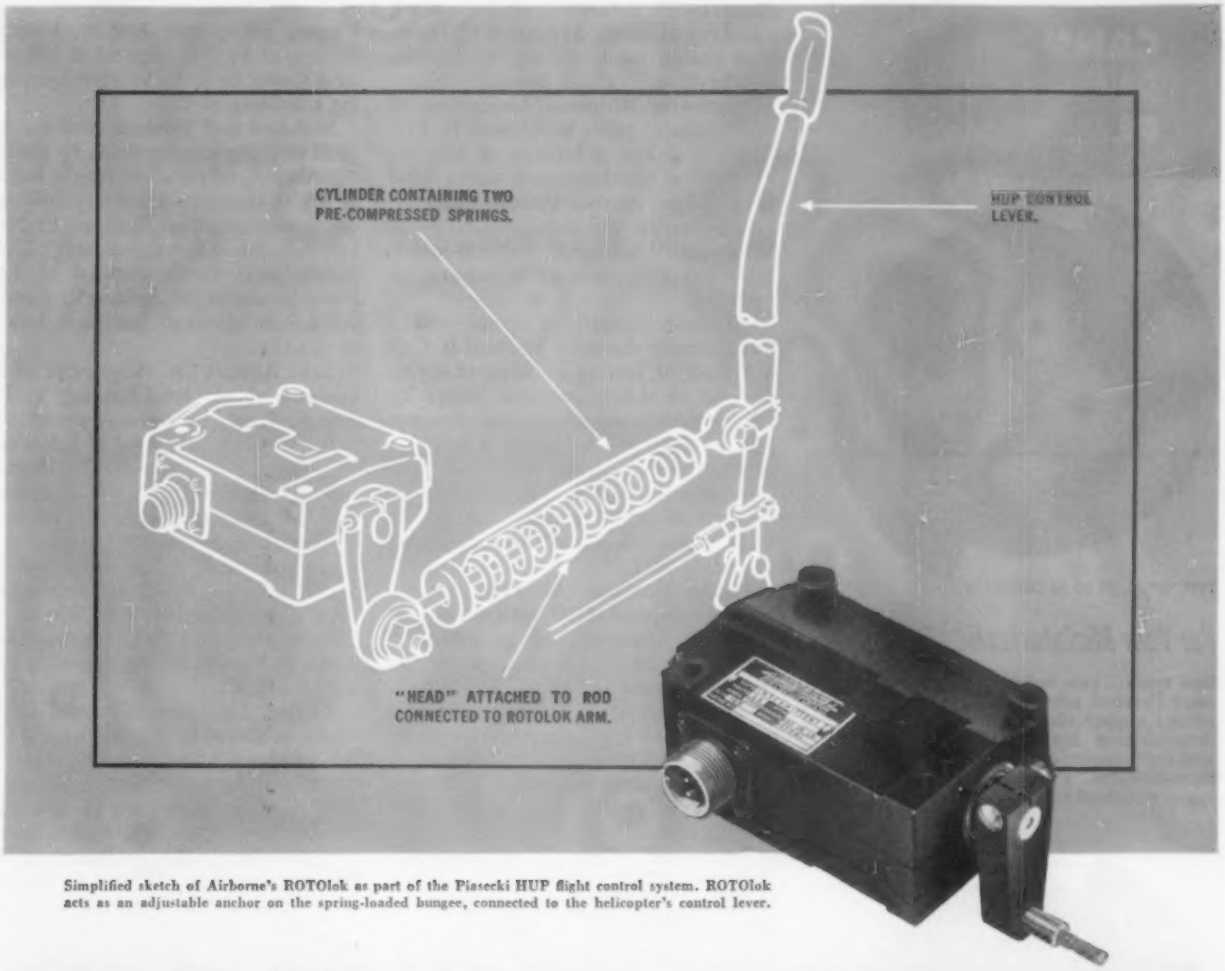
Lockheed Aircraft Corp. Disposal of 172 capital shares by Charles A. Barker Jr., director, leaving a holding of 1,000; disposal of 1,000 capital shares by H. R. Campbell, officer, leaving a holding of 1,150; disposal of 800 capital shares by Burt C. Monesmith, officer, leaving a holding of 250.

Glenn L. Martin Co. Disposal of 7,000 common shares by Glenn L. Martin, director, leaving a holding of 292,695; disposal of 500 common shares estate of Duncan M. Spencer, director, leaving a holding of 1,500.

Minneapolis-Honeywell Regulator Co. Acquisition of 1,300 common shares by Harry Heltzer, director, making a holding of 1,500; disposal of 300 common shares by Stacy R. Allen, officer, leaving a holding of 1,200.

Copter Carries Own Dolly

Coast Guard Bell HTL eases down onto a new portable dolly, weighing only 40 lb., designed to handle helicopters at places where such facilities are not available. The rig quickly disassembles into five sections which are carried by the copter. The copter lands, the crew assembles the dolly and then flies the craft onto the device for ground transportability. It was developed at USCG's Brooklyn, N. Y., Air Station, which will fit all of its float-equipped copters with the portable platforms.



Simplified sketch of Airborne's ROTOlok as part of the Piasecki HUP flight control system. ROTOlok acts as an adjustable anchor on the spring-loaded bungee, connected to the helicopter's control lever.

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GENERAL CHARACTERISTICS

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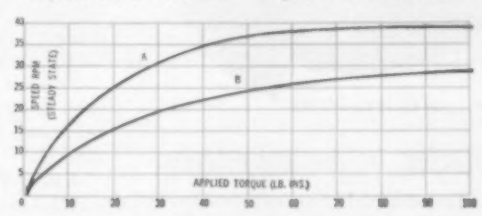

ROTOlok damper effect. Curve "A" represents speed-torque characteristics with a metal-to-metal damper; curve "B" with a friction-lined damper. ROTOlok is available with either.

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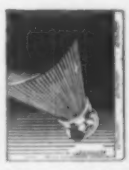

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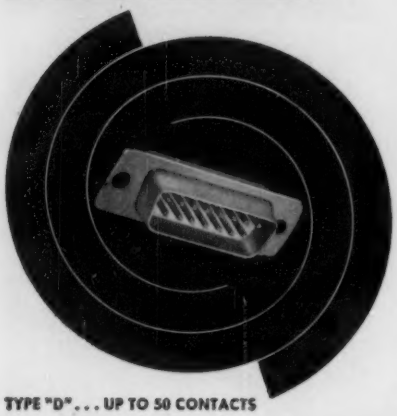

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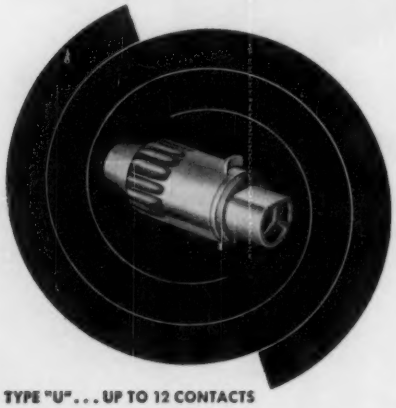

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Co. Acquisition of 1,300 common shares by H. F. Dever, officer, making a holding of 2,000; disposal of 670 common shares, total holding, by Charles B. Sweatt, officer and director.

Northwest Airlines. Acquisition of 300 common shares by Morton H. Fry, director, making a holding of 500; acquisition of 1,000 common shares, total holding, by Alonzo Petteys, director; acquisition of 400 common shares by Wheelock Whitney through Whitney Securities Co., making a holding of 1,900.

Northrop Aircraft. Disposal of 13,600 common shares by William B. Collins, director, leaving a holding of 6,400; disposal of 4,800 common shares by John W. Myers, officer and director, leaving a holding of 3,064; acquisition of 200 common shares by John O'Melveny, director, making a holding of 321; disposal of 2,904 common shares by R. J. Pagen, officer and director, making a holding of 1,452.

Pacific Northern Airlines. Acquisition and disposal of 200 common shares by M. E. Diamond, officer, making a holding of 28,713; acquisition of 300 common shares by M. B. Kirkpatrick, director, making a holding of 2,001; acquisition of 1,500 common shares by Harold A. Olsen, officer, making a holding of 7,600; disposal of 500 common shares, total holding by Paul Porzelt, director.

Pan American World Airways. Acquisition of 209 common shares as compensation and disposal of 473 shares by Alvin P. Adams, officer, making a holding of 209, and these acquisitions as compensation; 152 common by Henry H. Berke, officer, making a holding of 1,005; 171 common by R. G. Ferguson, officer, making a holding of 903; 266 by Franklin Gledhill, officer and director, making a holding of 1,752; 266 common by Wilbur L. Morrison, officer, making a holding of 10,361; 171 common by Clarence M. Young, officer, making a holding of 891.

Philco Corp. Disposal of 1,000 common shares by Thomas A. Kennally, officer and director, leaving a holding of 10,032.

Radio Corporation of America. Acquisition of 100 common shares, total holding, by Walter Bedell Smith, director.

Raytheon Manufacturing Co. Disposal of 320 common shares by Carl J. Gilbert, director, leaving a holding of 1,000; acquisition of 2,200 common shares by Percy L. Spencer, officer, making a holding of 2,203; disposal of 165 preferred shares, total holding, by Paul F. Hannah, officer.

Reynolds Metals Co. Acquisition of 281 common shares by Calvin E. Coghill, officer, making a holding of 1,546.

Rheem Manufacturing Co. Disposal of 700 common shares L. W. Evans, officer, leaving a holding of 300; disposal of 7,100 common shares by D. L. Rheem, officer and director, leaving a holding of 86,900; disposal of 100 common shares by J. F. West, officer, leaving a holding of 19.

Seaboard and Western Airlines. Disposal of 500 common shares by Douglas M. Amann, director, leaving a holding of 6,930; disposal of 1,800 jointly held common shares by Wallace P. Neth, officers and directors, leaving 27,249 jointly held shares; disposal of 2,500 common shares by Arthur V. Norden, officer and director, leaving a holding of 26,121.

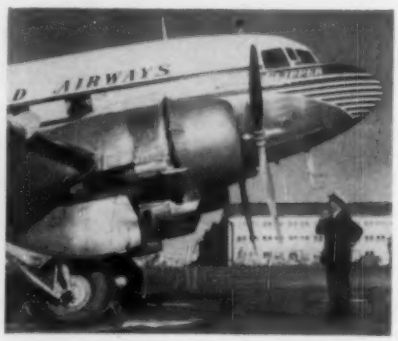
Solar Aircraft Co. Acquisition of 200 common shares, total holding, by Herbert F. Sturdy, officer and director.

Sperry Corp. Disposal of 1,400 common shares by Thomas B. Doe, director, leaving a holding of 6,000; acquisition of 8,000 common shares by Preston R. Bassett, officer, making a holding of 15,272; disposal of 300 and acquisition of 500 common shares by Lindsey Hopkins, director, making a holding of 14,350; disposal of 7,500 common shares by H. F. Vickers, officer, leaving a holding of 30,800.

United Air Lines. Disposal of 100 common shares by R. W. Ireland, officer, leaving a holding of 445.

United Aircraft Corp. Disposal of 500 common shares by H. Mansfield Horner, president and director, leaving a holding of 3,000; disposal of 300 common shares by William R. Robbins, officer and director, leaving a holding of 2,500.

Western Air Lines. Acquistion of 1,000 capital shares through exercise of an option by Terrell C. Drinkwater, officer and director, making a total holding of 3,000.



PAA Streamlines DC-3

New main wheel well doors on the Douglas DC-3 increase the plane's cruise speed 10 mph., Pan American World Airways reports. Actuation is automatic in conjunction with retraction of main landing gear. Retraction cycle is 7-11 sec., compared with 20 sec. for the standard gear. Doors add 80 lb. to plane's weight. Modification was made at PAA's Brownsville, Tex., base.

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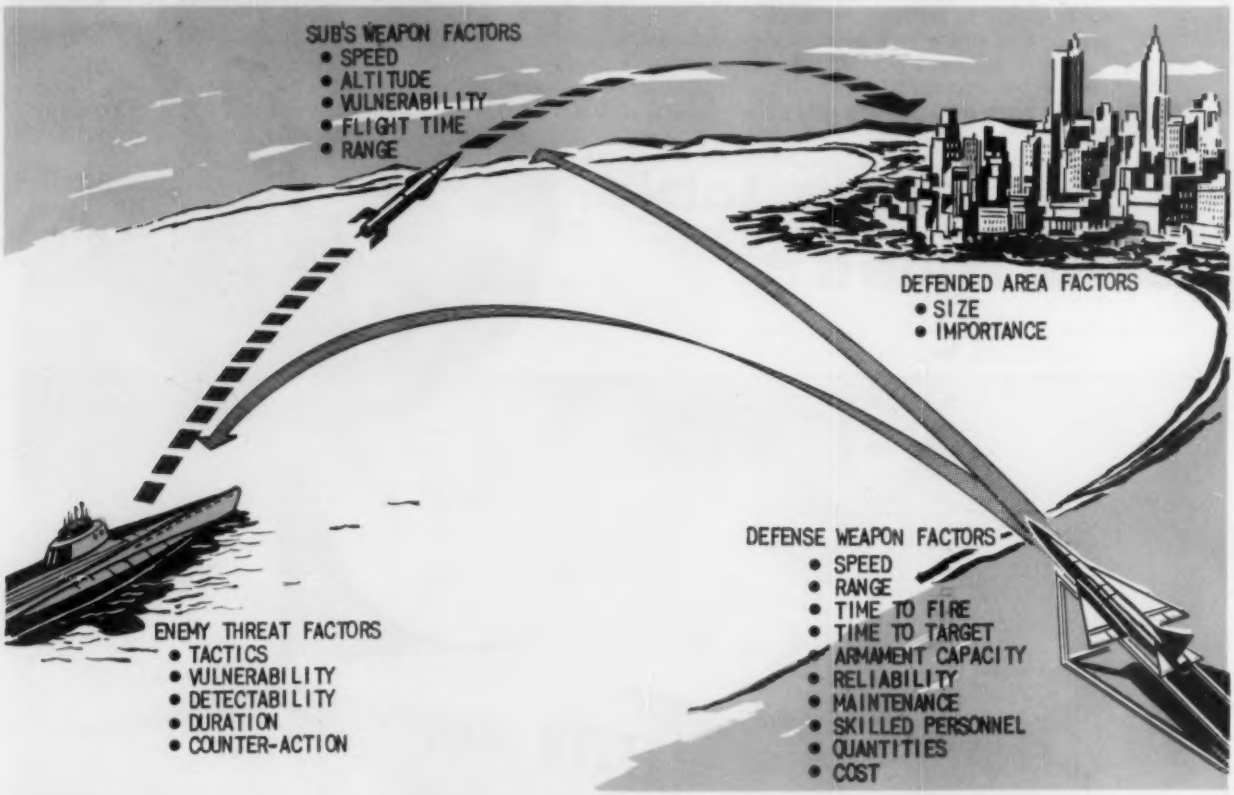


PRIME FACTORS in hypothetical weapon system involving defense against missile-firing or plane-carrying submarine. Interaction among these factors determines choice of preferred weapon system. Neglect of any essential factor will result in ineffective system.

How an Air Weapon System Is Evolved

By Irving Stone

Hawthorne, Calif.–Not too long ago aerial weapons evolved from a lot of specific requirements. The military called out almost everything–speed, ceiling, range, engines, armament, details down even to the type of gunsight.

Today the approach is just about reversed–only a broad generality marks the beginning of a weapon system. A general defense problem may be projected; the specifics evolve as the solution.

The difference in complexity and effort between these two approaches is tremendous.

Today's job boosts the workload for initial analysis, introduces ramifications which tax the best engineering brains. Not only is airborne article involved, but all ground-support material as well.

Operational times have become extremely short, equipment complication is staggering, small error can be catastrophic. Keying the capabilities of the various components is a gigantic task.

All this points to the need for top analytical groups. One example of such a group is Northrop Aircraft, Inc.'s Weapon Systems Analysis Dept. (WSAD), headed by Herbert K. Weiss and his assistant, Ward B. Dennis.

► **Typical Problem**–Take this general, hypothetical problem:

Defend a continental U. S. target against attack by submarines or weapons (perhaps missiles, rockets or small manned aircraft) carried by them.

Here is how a group like Northrop's WSAD would proceed:

First, determine the characteristics of the targets which must be defended, the manner in which they affect enemy tactics, and the way these tactics are limited by the characteristics of the submarines.

Weapons which could be used to attack the submarines are then to be considered.

This develops the problem of detecting and locating the U-boats and directing the defensive weapon system (still undefined at this stage of the thinking) to the pinpointed submarine.

► **Time Affects Choice**–At this stage of solution development, periods of time involved are considered. Time between alert and completion of enemy mission are examined and the type of defensive weapon determined to meet this time requirement, a controlling factor.

• **If time involved is moderate,** the design requirements for the defensive weapon may yield a high-performance, but subsonic, anti-submarine aircraft.

• **If time requirement is severe**–yet not extremely so–it may be satisfied by a supersonic manned aircraft.

• **As time becomes more critical,** the possibilities of a defensive missile, possibly with a portion of its trajectory underwater, may be examined.

• **When 30 sec. to 1 min.** is the order of the available time, increasing empha-

sis and thought are given to accomplishing the destruction of the submarine's weapon after it has been launched, since the cost of building a system to attack the submarine directly might be greater than the cost of destroying its projected weapon, whether it be missile, rocket or man-carrying plane.

(In all these cases, the study would be prefaced with an examination of existing and planned weapon systems which the study under analysis would supplement. Thus, it might even be concluded that the best weapon system obtained from the new analysis would not provide a sufficient increase in defense to justify the expenditure of funds required for its development. However, it might be indicated that the existing weapon system is at a critical point and that improvements to it might be profitably explored.)

▶ **Preliminary Design Enters**—Having indicated the general type of weapon system that could satisfy the conditions of defense, next step is to determine the specific design characteristics of the system components.

Here, the major portion of the design analysis would be done by Northrop's Preliminary Design Group with the assistance of specialized departments such as Guidance, Flight Controls and Servo Mechanisms, Fluid Dynamics, Structures.

It is important here to know when company's capabilities end and to call in a specialist service with particular knowledge in a specific field.

In the transfer of responsibility from WSAD to Preliminary Design, the former recommends design objectives such as the missile's or plane's range requirement, payload, weather capability, altitude, speed, time for launch or to become airborne, condition of readiness (a specified period; or in case of a missile, whether continuous power would have to be supplied or whether power could be turned on upon receipt of the alert signal).

These objectives are presented to Preliminary Design for detailed definition of the weapon system configuration.

▶ **Follow-Up Role**—At this point, Northrop's WSAD becomes a secondary function, taking on a follow-up role to preliminary design and successive stages, even as far along as the production stage.

In its follow-up role, WSAD reviews the progress of the design from the viewpoint of the complete weapon system concept, to insure that design alternatives are selected on the basis of projected effectiveness.

Example—The terminal phase in the attack on the submarine: Should it be a high-altitude approach with a sharp terminal dive or a low-altitude approach?

The high-altitude approach might give a more accurate delivery system, but introduces more vulnerability to the submarine's defenses; the low-altitude approach might be less accurate but the weapon used against the submarine might be more difficult to detect.

This points up one consideration which would have to be resolved.

Similarly, there may be many other alternate choices which would have to be screened carefully. At first look some of the factors may appear more important than others, but in relation to the overall problem, each is a key consideration, requiring as much analysis as any other.

▶ **Programming Plan**—A third function of WSAD is to support new proposals made by Northrop in response to military-service request, and proposals generated within departments such as Preliminary Design.

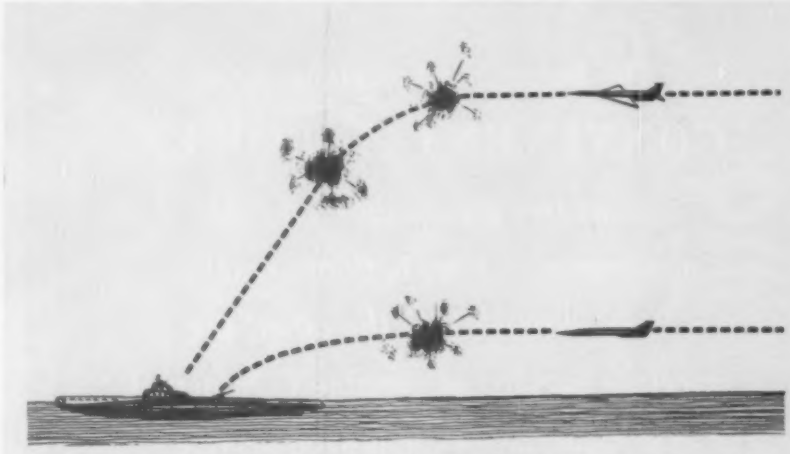
In this role, WSAD sets up a programming procedure which constitutes a complete weapon system development plan. This program integrates:

- **Aircraft or missile development timetable.**
- **Ground-support equipment.**
- **Flight testing.**
- **Training.**

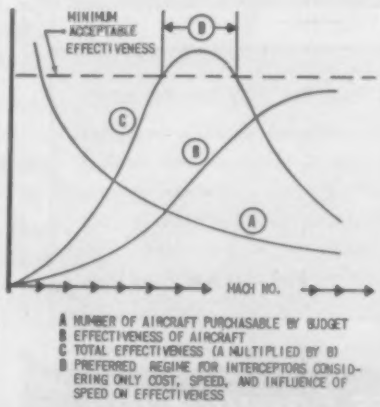
This insures that the complete system will be developed in accordance with the plan, so no single component will delay any particular phase.

For instance, timing is scheduled to initiate the training program with adequately prepared crews, so that the testing program will proceed according to plan. Or the programming plan may insure that a particular piece of ground-support equipment, such as a test analyzer, is available when needed. Or, it may determine the number of aircraft, missiles or units of ground-support equipment which will be required for contractor testing and subsequent customer-testing.

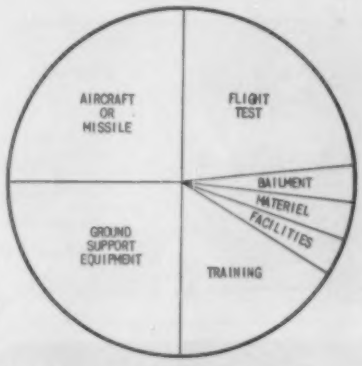
(This is the first of a series of articles on weapon system design, development and operation.)



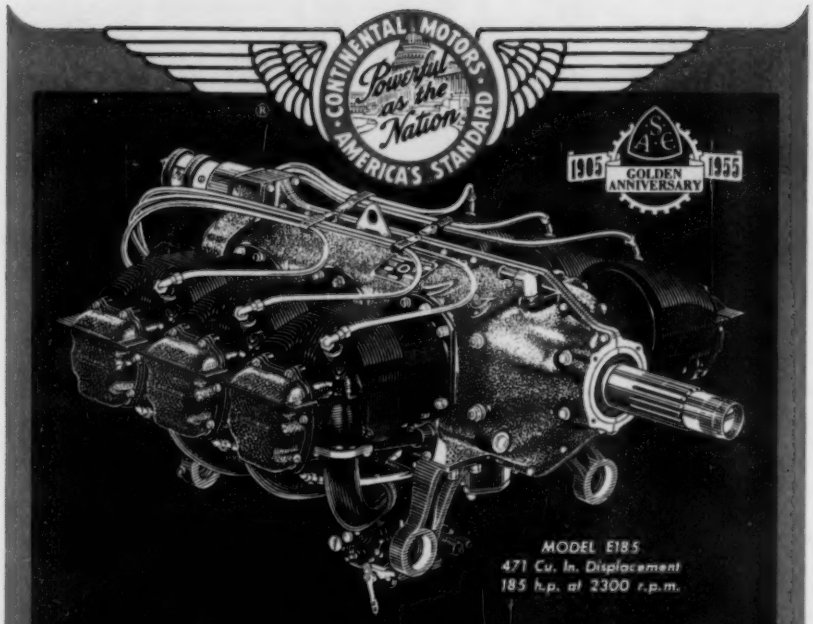
TYPICAL CHOICE to be resolved in system definition is between high-altitude, high-accuracy, low-survival-probability trajectory, or low-altitude, less-accurate, but less-detectable trajectory.


MINIMUM ACCEPTABLE EFFECTIVENESS
D
C
B
A
MACH NO.
A NUMBER OF AIRCRAFT PURCHASABLE BY BUDGET
B EFFECTIVENESS OF AIRCRAFT
C TOTAL EFFECTIVENESS (A MULTIPLIED BY B)
D PREFERRED REGIME FOR INTERCEPTORS CONSIDERING ONLY COST, SPEED, AND INFLUENCE OF SPEED ON EFFECTIVENESS

COMPROMISES must be made in choice of weapon system. Increase in speed boosts single aircraft effectiveness but may increase individual aircraft expense. Best choice may be for less than maximum speed.



PIE CHART illustrates the main parts of a weapon system which must be coordinated in the overall development plan. Any item which is not brought along properly can jeopardize the entire plan.



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OPPORTUNITIES UNLIMITED—INVESTIGATE YOUR AIR FORCE RESERVE TODAY

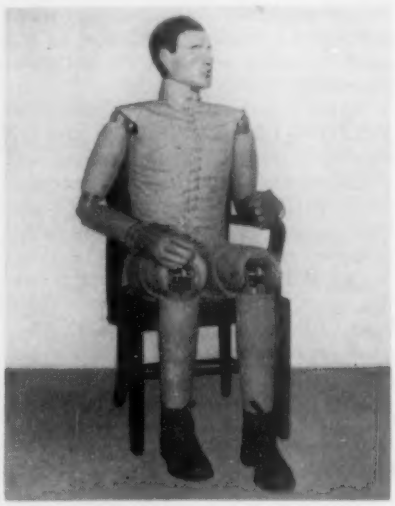
Defense Dept. Opens Titanium Laboratory

A titanium metallurgical laboratory to provide a source of detailed technical advice needed by government contractors and their suppliers has been established by the Department of Defense under contract with Battelle Memorial Institute, Columbus, Ohio. The move was recommended by Donald A. Quarles, Assistant Secretary of Defense (Research & Development).

The facility will gather and disseminate information and supply advice on production and application of titanium for military equipment. The laboratory will also assist and advise the Research and Development Coordinating Committee on Materials of the Defense Department in appraisal of its titanium program.

It will also aid government agencies and contractors in developing data needed for preparing specifications for titanium metal and mill products, and handle short-range laboratory investigations to determine fabrication difficulties.

The project will supplement existing customer-service services that are provided by industry and government laboratories.



Meet 'Sierra Sam'

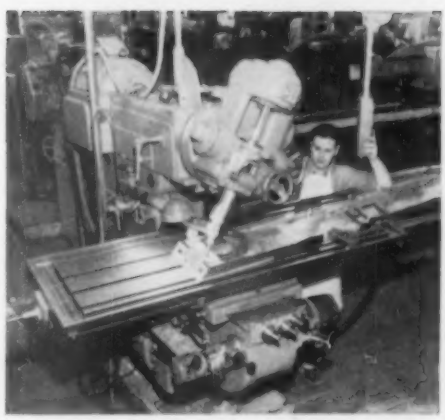
Two lower-price "brothers" have been added to the family of "Sierra Sam" (above) anthropometric anthropomorphic dummy used in human engineering. New Models 157 and 160 faithfully reproduce dimension and weight distribution of a six-foot 200-lb. man., have articulation and detail for fitting flight gear. Models can contain numerous test instruments for trials to 100G. Company also maintains factory repair service, parts inventory and staff of application engineers. Maker: Sierra Engineering Co., 123 E. Montecito Ave., Sierra Madre, Calif.

Famed for its combat superiority with the United Nations in the skies over Korea, the Sabre Jet is now being supplied to other NATO countries.

Twin Coach Aircraft Division was selected as a subcontractor for large and intricate machinings for the F-86 as well as for North American Aviation's other high-performance aircraft, the F-100 and FJ4.

These important assignments are typical of the way in which leading airframe manufacturers rely on Twin Coach as a source of major airframe assemblies.

If you have an assembly you're considering subcontracting, call Twin Coach for consultation. Our *aircraft* experience . . . our 23½ acres of plant and facilities are at your disposal.

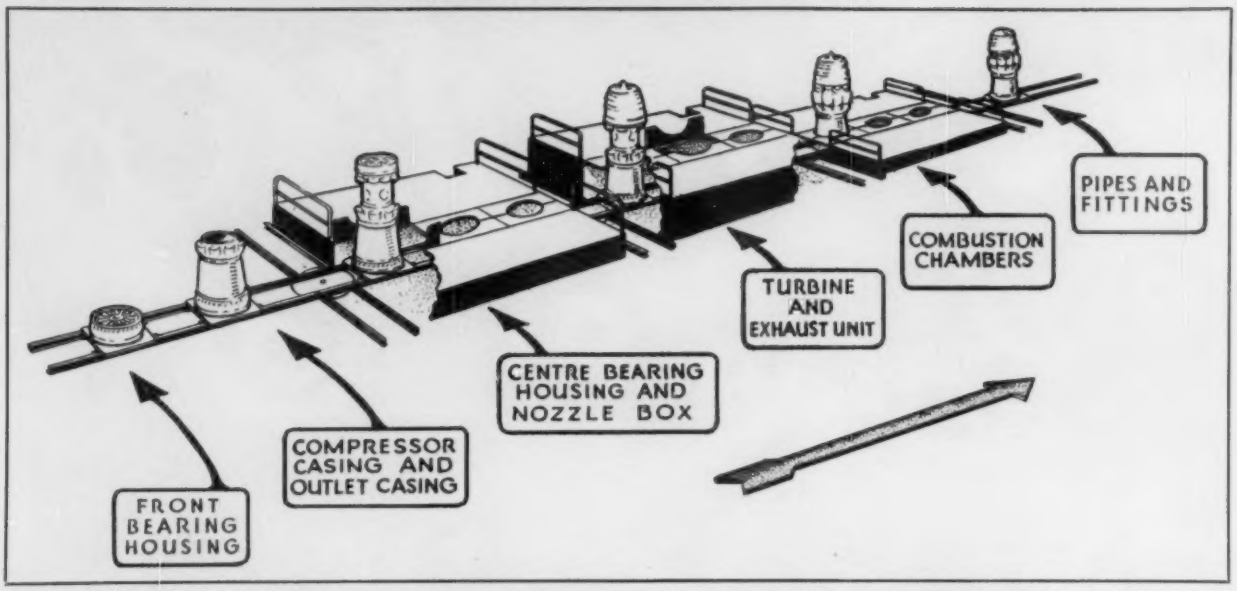


Twin Coach Aircraft Division plants turn out wing spars, main wing panels, flaps, complete center sections with plumbing and electrical wiring, and other large assemblies.

OTHER DIVISIONS OF TWIN COACH COMPANY MAKE: *Fageol Van and Pony Express Trucks, Fageol Gasoline and Propane Engines, Fageol-Leyland Diesel Engines.*

TWIN COACH COMPANY
Aircraft Division BUFFALO, N. Y.

TWIN COACH AIRCRAFT DIVISION MAKES ASSEMBLIES FOR BOEING, CESSNA, GRUMMAN, NORTH AMERICAN, REPUBLIC, AND CLASSIFIED EXPERIMENTAL AIRCRAFT TYPES. AA-1168



MOVING LINE has raised platforms at some stations to give easy access to upper portions of vertically assembled Avon turbojets.

Rolls-Royce Uses New Assembly Line

(McGraw-Hill World News)

London—Rolls-Royce has gone to a rail-type moving assembly line for producing Avon turbojet engines at its new plant at East Kilbride, Scotland.

Initially instituted as a temporary measure, pending completion of the factory and another type of installation, the new layout proved so efficient that it has been retained as a permanent production scheme.

This moving assembly line method contrasts with the static, single-spot system used at Rolls' main plant at Derby, England, where engines are assembled on hydraulic lifts by teams of mechanics who can perform any task.

These vertical hydraulic lifts, imbedded in the factory floor, were to be the final installation at the new plant. Instead, each workman at East Kilbride, in typical assembly-line style, now performs a small number of highly specialized operations. The expensive hydraulic lifts are employed only in the engine test area where they are used for working minor adjustments.

▶ **Definite Advantages**—Rolls-Royce officials cite these advantages of the assembly line vs. the hydraulic lift method of jet engine assembly:

- **Less lost motion** in handling materials.
- **Fewer workers** needed per unit of capacity.
- **Less time** required to train workers.
- **Simple, low-cost construction** and easy installations.
- **Great flexibility** in production capacity.
- **Low capital** investment.
- **Negligible maintenance** ("a little paint every three years").
- **Great mobility**—easy to move in case of plant relocation.
- **Easily adaptable** to different size engines.

▶ **Possible Disadvantage**—One possible disadvantage of the assembly-line system feared by Rolls-Royce technicians: It may be difficult to handle engine modifications quickly.

In an emergency, ability to make modifications quickly may be of vital importance. Here is an example: During World War II it became essential to add 8 mph. to the top speed of the Spitfire to enable it to catch the V-1 flying bombs. Rolls' assembly teams, trained in all operations of the Spitfire's Merlin engine construction, were able to begin turning out more powerful powerplants within hours.

Nevertheless, Derby is pleased with the lower unit cost of operation of its latest factory, and any new jet engine lines Rolls sets up will probably use the assembly-line technique.

▶ **What It Is**—The line consists of a 65-ft.-long track made up of metal "U" beams set on their sides and bolted to the factory floor. Several work stations are arranged along either side of the track.

Some of the stations are raised above the floor to facilitate work to be done at particular stages. The raised flooring at these stations is tailored to fit around the engine precisely and hinges up to allow the engines to pass through the stations.

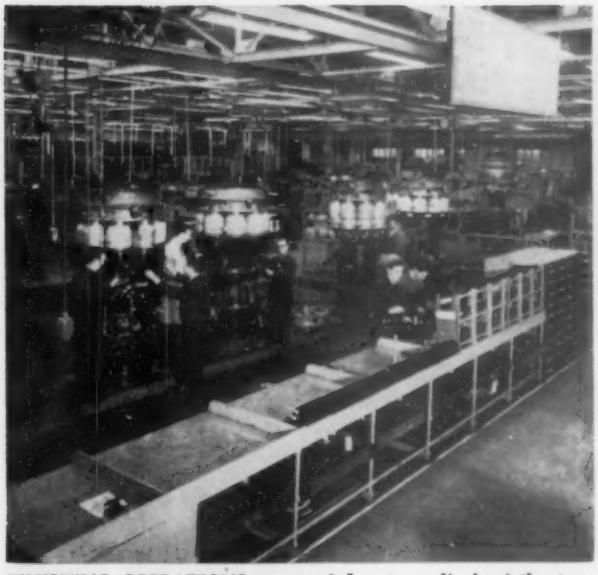
The engine starts at one end of the line on a specially built mounting base attached to a four-wheeled dolly. The engine, on its dolly, is pushed by hand from station to station, where the various engine parts and components are fed in.

The engines then grow vertically as they move down the assembly line and emerge from the far end as completed units.

Each stage is provided with a turntable which allows the engine to be shunted off of the main production line in case it requires modification or other specialized work. In case of emergency, the sidings could be used as additional assembly stations.

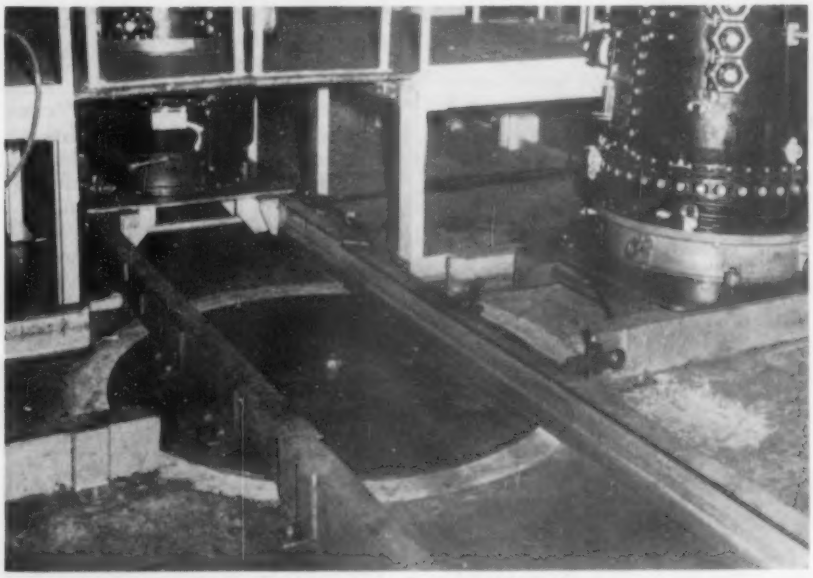
▶ **How It Works**—Here is how Rolls-Royce has organized the jobs to be performed at each station.

- **First stage** of the assembly line has two work stations to install the front bearing housing and air intake.
- **Second stage** has three stations to add compressor rotor and compressor casing, including stator blades.
- **Third stage** (first raised stage) has three stations to install compressor outlet casing, rear bearing housing, and auxiliary drive section.
- **Fourth stage** is the highest and has three work stations for assemblying the nozzle box, turbine, auxiliary piping and fuel system units.



FINISHING OPERATIONS are carried out on line's sixth stage.

CONVEYOR TRUCKS feed parts from sub-assembly to main line



TURNTABLE allows Avons to be shunted off for special work.

COMBUSTION chamber is fitted to Avon jet.

• **Fifth stage** is where combustion equipment is added—flame tubes, combustion chambers, etc.

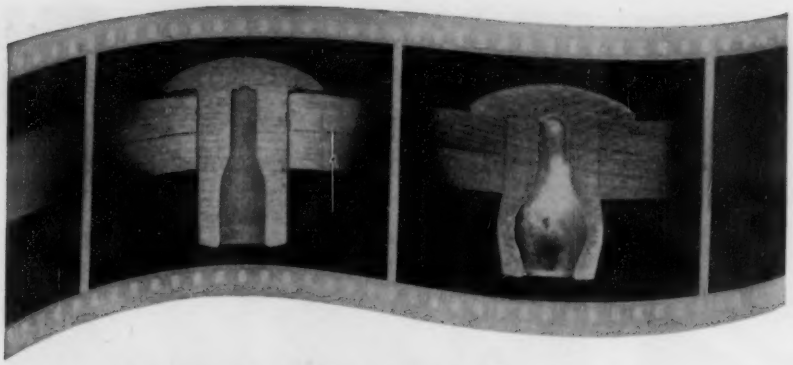
• **Sixth stage** is for finishing operations, such as the installation of various accessories, etc.

The assembly line can easily handle a work load equivalent to the production capacity of 12 hydraulic lifts.

► **Specific Savings**—Some of the specific savings attributed to the assembly-line production system as compared to the hydraulic lift method are:

• **Material handling is reduced**—It is more efficient to convey parts and components directly from sub-assembly lines to points where they are needed on the main assembly line than it is to carry all parts and components to many lift sites. This economy alone saves approximately $11,000 a year.

MACHINE SHOP LAYOUT at Rolls-Royce new Avon jet factory in East Kilbride, Scotland.



Here's the inside story on Du Pont Aircraft Rivets

Q. What are Du Pont Aircraft Rivets?

A. They're strong, one-piece fasteners resembling solid rivets, but with one important difference: enclosed in each is a tiny, centered explosive charge which runs the length of the shank (note left photo, above).

Q. How do they work?

A. You simply drill hole, insert Aircraft Rivet, apply heated riveting iron. Rivet expands . . . forms barrel-like shop end . . . completely fills hole in as little as ½ second (photo at right).

Q. How fast can you set 'em?

A. Up to 20 a minute in blind, hard-to-reach or open work, with no after-finishing required. No pneumatic hammer, bucking bar or other equipment, either—you work only from *head side*. It's a one-man, one-tool job!

Q. What about primary and secondary applications?

A. Aircraft Rivets are designed to handle *both*. For example, one leading manufacturer uses them to fix a U-shaped channel member to canopy assembly; another, to attach skin to wing.

Q. What are they made of—what sizes available?

A. You can obtain Aircraft Rivets in 17S-T or 56S alodized aluminum alloy, (conforming to Military Spec. MIL-R-7885), in 1/8", 5/32", 3/16" and ¼" diameters. Nickel rivets, also widely used in military aircraft and missiles, are available in the first three sizes. Your choice of regular or blast-free Rivets—brazier or 100° countersunk heads.

Q. Do they require refrigeration?

A. Absolutely not.

Q. Are there any special-type rivets?

A. Though standard Aircraft Rivets will meet most requirements, there are types for specialized applications. These include a new High-Temperature Rivet, now used in jet-engine and missile structural parts, which retains its strength at 1400°F. —and a blast-free honeycomb Rivet.

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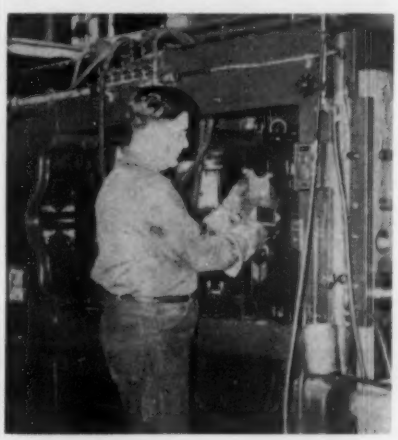
the equivalent of 12-lift capacity, requires 24 fitters plus two helpers. Twelve hydraulic lifts would require six helpers with the 24 fitters, another saving.

• **More important,** it takes six to nine months to train a fitter to assemble a jet engine on hydraulic lifts since he must know every detail of assembling a jet engine. And it takes another six months for him to reach maximum efficiency. On the assembly line, where each fitter needs know only one or two operations, training time is four weeks, perfection time another four weeks.

• **Hydraulic-lift system** requires foundations in the plant's floor, a compressor to supply hydraulic power, and heavy overhead traveling cranes for each lift site to haul away completed engines. The assembly line requires only shallow, 4-in. excavations in the factory floor to locate turntables; heavy crane facilities are required only at the end of the line. Light cranes are adequate to lift heavy components into position at appropriate work stations.

• **Further saving results** from reduction in tools required. In the case of the hydraulic lifts, each of the 12 "teams" requires a full set of tools. With the assembly line's departmentalized type of operation, approximately only two complete sets of tools are required for a 12-lift-capacity operation.

• **Versatility of the assembly line** is underlined by the fact that it can readily be changed to handle different sizes of engines. This is a job of considerable



Sheathes for Magnets

New 400-ton die casting machine casts aluminum sheathes on large magnets, such as those used in radar stations, for insulation and to simplify their installation. In casting the ¼-in.-thick casing at 2,000 psi., no special holding methods are needed to hold the magnets on the two-piece cavity—they supply their own magnetic "pull." A 3,000-psi. pressure ejects the finished work from the machine. Scene is at permanent magnet plant of Carboloy Dept. of General Electric Co., Edmore, Mich.

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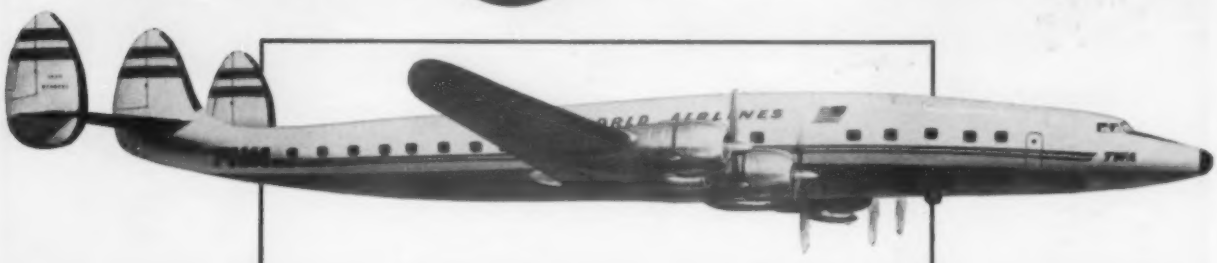

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Another turboprop first by Aeroproducts!

NAVY R3Y TRADEWIND WITH AEROPRODUCTS TURBOPROPS COMPLETES RECORD HOP!

Convair eighty-ton cargo-transport, powered by Allison gas turbine engines and Aeroproducts turbopropellers, flies coast to coast in six hours for seaplane record

Aeroproducts turbopropellers made flight history again February 24 when they helped power the Navy's giant R3Y Tradewind on the first cross-country hop of a turboprop seaplane. The 80-ton Tradewind flew non-stop from San Diego, California, to Patuxent River, Maryland, in six hours.

A cargo transport, the R3Y sets the trend toward wide use of turboprop engines and turbopropellers. This pioneering flight also marks another first for Aeroproducts. In 1945, an Aeroproducts turbopropeller was used on a Convair F-81 in the first flight of a turboprop-powered plane in the United States. In fact, Aeroproducts turbopropellers have more flight time than any other American-made turbopropellers.

But turbopropellers are just a part of Aeroproducts' contribution to safer, more efficient flying. Aeroproducts is ready *now* to meet your specifications for other propellers, air-driven emergency generators, air-driven hydraulic pumps, actuators, other aircraft components still in the development stage. Call or write for details.

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magnitude when hydraulic lifts are used.

► **Self-Propelled Carts**—An interesting innovation in Rolls's East Kilbride plant is the use of self-propelled carts which are hooked at will to underfloor continuous chains. The unattended carts are used to haul parts, spares, scrap, etc., from one part of the factory to another.

As each cart is dispatched, it is coded with a steel pin, attached to its side, which signals its destination on arrival. As the carts move from one bay to another, they trip switches which automatically open first one, then the other of double airlock doors. The carts move at just under a walking pace.

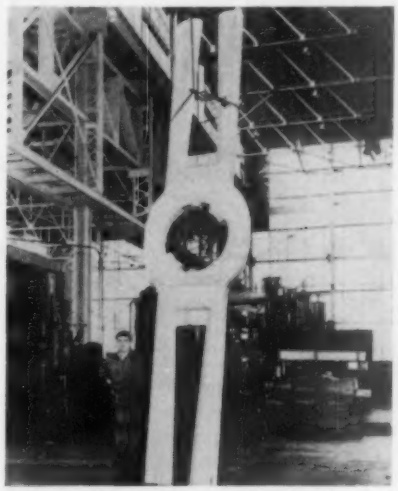
East Kilbride's new-parts stores for the Avons are located at the foot of the sub-assembly lines feeding into the main line. Shelves, racks and bins are welded metal pallets made to fit into one another. Only three basic types are used.

They can be rearranged at will with a fork-lift truck. All bins, racks and shelves are coded according to the part to be stored. Wherever practical, storage spaces are fitted to accommodate only specific parts.

Units to be taken out of store for transfer to sub-assembly lines are placed in fitted trollies similarly equipped with fitted, coded compartments. Each trolley has exactly enough spaces to service 10 subassemblies. It takes 60 such carts to carry all parts and components to make 10 completed Avons. Carts are filled by stores clerks and checked out as needed by sub-assembly workers.

A pneumatic tube system is being installed to speed paperwork. Cartridges will be guided through a single-tube system by preset sound reeds, frequency-coded to various destinations. An automatic monitor in the system yanks out any cartridge that makes the circuit twice without finding a home.

All walls within the various bays are temporary modular units. As little as possible has been permanently installed. The whole plant could be completely rearranged over a weekend.

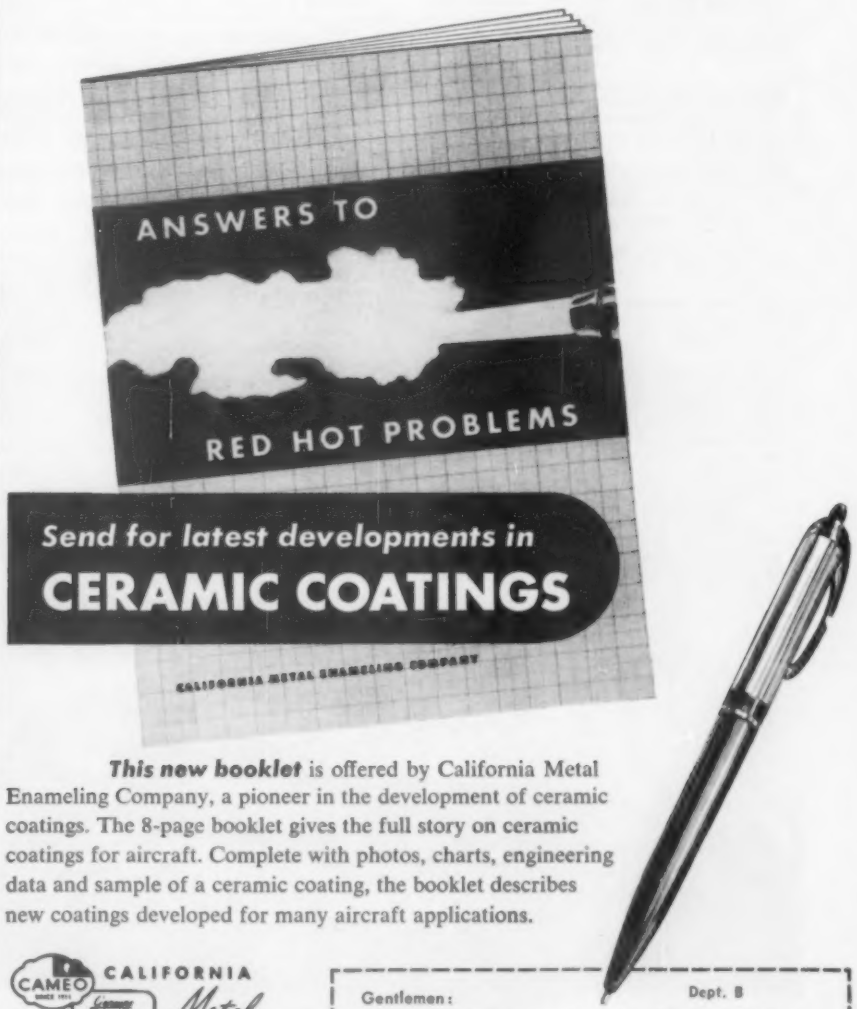


Heavyweight Forging

Here is the largest aluminum alloy closed die forging ever made for the aircraft industry, states Bridgeport Brass Co., Conn. Weight is over 2,600 lb. and dimensions are about 18x4 ft. Forging was made on a 16,500-ton press at Bridgeport's Aluminum Division, Adrian, Mich., where company operates a plant leased from USAF. It was expected that such a large forging would require a much larger press, such as the 35,000- or 50,000-ton units in the Air Force heavy press program. Production of this item indicates that with special handling, capacity of the 16,500-ton press can be enlarged, freeing the heavier presses for even larger jobs.

New NAA Adhesives

Two modified phenolic adhesives for use in high temperature and humidity environments have been developed by North American Aviation, Inc., at Downey, Calif. NAA Hi-Temp is used for bonding metals and reinforced plastics; CHT is for fabricating "sandwich" components. NAA has licensed Rubber & Asbestos Corp. and American Latex Products Corp. to make and market the new adhesives.



This new booklet is offered by California Metal Enameling Company, a pioneer in the development of ceramic coatings. The 8-page booklet gives the full story on ceramic coatings for aircraft. Complete with photos, charts, engineering data and sample of a ceramic coating, the booklet describes new coatings developed for many aircraft applications.

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USAF Contracts

Following is a list of recent USAF contracts announced by Air Materiel Command.

Brunswick-Balke, Collender Co., Chicago, facilities for testing radomes, $29,063.

Chicago Aerial Survey Co., Chicago, viewer VA-1, 11 ea., comparator, measuring, 7 ea., $25,226.

Cook Elec. Co., Chicago, A-2 inverter changeover, $42,068.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., indicator, type F-1, 242 ea., transmitter type MA-1, 4 ea., indicator type A16, 7 ea., $122,926; transmitter, torque pressure, 2,440 ea., $201,300.

Engr. Prod. Div., Radio Corp. of America, Camden, N. J., adapters, headset, 11,000 ea., $200,000.

Federal Telephone and Radio Corp., Clifton, N. J., transformer, 150 ea., rectifiers, 25 ea., 990 ea., $223,740.

General Electric Co., W. Lynn, Mass., indicator, 300 ea., elec. tachometer, 135 ea., $36,892.

Goodyear Tire and Rubber, Akron, Ohio, wheel assy., 723 ea., brake assys., 1,729 ea., brake assys., 800 ea., $1,585,627.

Hydro-Aire, Inc., Burbank, Calif., actuator assy., 81 ea., screwjack, 1,794 ea., actuator rotary air plug, 334 ea., $330,335.

Kollsman Instrument Corp., Elmhurst, N. Y., airspeed indicator, 1,274 ea., $536,883; pressure transmitters, 1,279 ea., $215,578.

Lear, Inc., Grand Rapids, Mich., product improvement, $29,615.

RCA Victor Div., Radio Corp. of America, Los Angeles, radar signal sim., 50 ea., $302,510.

Red Bank Div., Bendix Aviation Corp., Eatontown, N. J., regulators, voltage, 137 ea., $49,166.

Thompson Optical Engr. Co., Los Angeles, photographic window panes, $36,990.

U. S. Gauge Div., American Mach. and Metals, Inc., Sellersville, Pa., indicator, 300 ea., fuel pressure, 201 ea., 1,723 ea., $30,748.

Westinghouse Air Brake Co., Union Switch and Signal Div., Swissvale, Pa., mod. of flight simulator, 16 ea., $440,000.

Westinghouse Electric Corp., Dayton, Ohio, a.c. generator, acft. eng.-driven, 86 ea., $71,065.

Wright Aeronautical Div., Curtiss-Wright Corp., Wood-Ridge, N. J., special tools and ground hndlg. equip. for acft. engines $310,000.

Acme Aluminum Alloys, Inc., Dayton 3, Ohio, fixture, computer tilt for setting various angles, in A/W Sperry Gyroscope, 100 ea., $65,000.

Bomac Laboratories, Inc., Beverly, Mass., tubes, electron, transmitting beacon, reflector, glass envelope, 1,692 ea., $101,520.

Carter Parts Co., Chicago 10, switch-toggle, four-pole double throw on-none-on, two position, 20,000,000 ea., $35,640.

General Electric Co., Schenectady 5, N. Y., tube-electron, cathode ray, 6,000 ea., $81,000.

International Telephone & Telegraph Corp., Federal Telephone & Radio Co. Div., Clifton, N. J., tube, electron transmitting triode general purpose-glass 3.750 in., dia. 6.750 in., 600 ea., $63,300.

Radio Corp. of America, R.C.A. Victor Div., Harrison, N. J., tubes, electron, JAN type 26A7GT, receiving pentode, 59,200 ea., $246,153.

Radio Corp. of America, Tube Div., Harrison, N. J., tube-electron JAN-type 832A transmitting pentode general purpose glass envelope, 83,415 ea., $638,124; tube-electron JAN-type 65J 7Y receiving pentode general purpose metal envelope, 77,000 ea., $46,585.

Sylvania Electric Products, Inc., Woburn, Mass., tube-electron transmitting gas TR JAN-Type 1B24A glass envelope, 1,187 in. dia., 14,800 ea., $217,856.

Vanant Products, Inc., Tomah, Wis., bag, metal foil, RFP-33-LB-55-792-1925, 7,280 ea., 5,700 ea., envelope, cellophane, 45,000 ea., $25,451.

Wright Electronics, Inc., Kansas City, Mo., crystal unit, 27,000 ea., $31,590.

Cessna Aircraft Co., Wichita, Kan., boot assys., 45 items, $69,055; door assy., 39 items, $74,200; stabilizer assy., 41 items, $84,513.

Hoof Products Co., Chicago 38, valve assy., 1,140 ea., $27,154.

Joy Mfg. Co., New Philadelphia, Ohio, fan, 269 ea., $66,660.

Lear, Inc., Lear-Romec Div., Elyria, Ohio, pump and motor assys., 160 ea., $47,432.

Rett Products Co., Detroit 14, fuel assy., 49,728 ea., $61,662.

Surface Combustion Corp., Janitrol Aircraft-Auto Div., Columbus 16, Ohio, heater assy., 15 items, $268,705.

Vickers, Inc., Detroit 32, housing stud, 8 items, $30,775.

Metimpex Corp., 666 Fifth Ave., New York 19, N. Y., brass, 28,791 lb., $28,239.

Ryan Aeronautical Co., Lindbergh Field, San Diego 12, Calif., clamps, 8,725 ea., $57,497.

Titan Metal Mfg. Co., Bellefonte, Pa., brass, red, 392,266 lb., $279,851.

Turco Products, Inc., 6135 South Central, Los Angeles 1, compound, cleaning, 801,750 lb., $47,142.

Lockheed Installs Mechanized Preflight Line

Following rollout from production lines, Lockheed T-33A jet trainers are put on a moving line where mechanics perform hydraulic and fuel-flow checks, engine runups and other preflight operations. Tractor pulls entire flight line ahead one station at intervals. Lockheed says the tracks could be modified to provide continuous movement if desired. The system has standby capacity to accommodate high production schedules if needed, the firm notes. This system for accelerating preflight checks has been installed at Palmdale, Calif., the Air Force's jet center.

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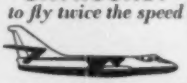

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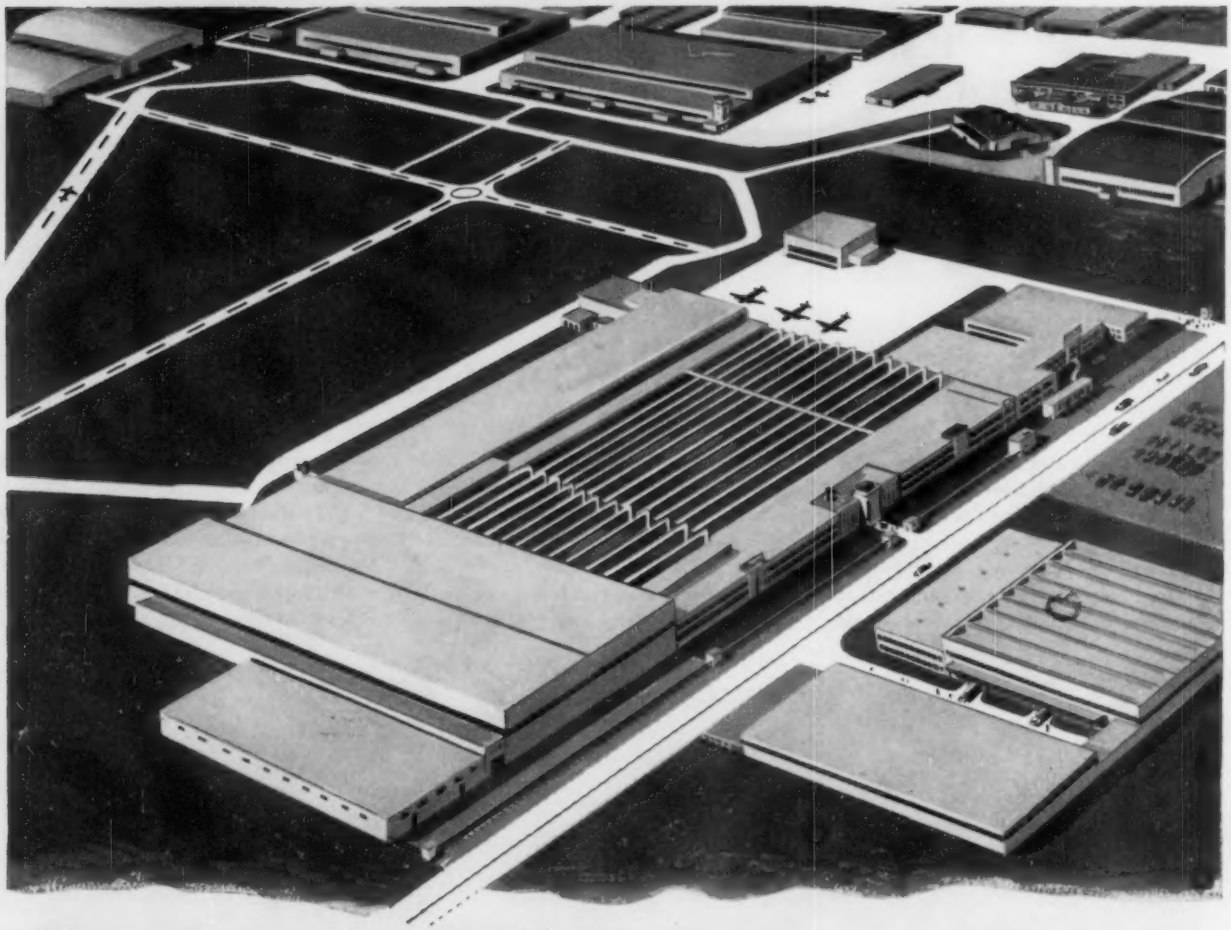

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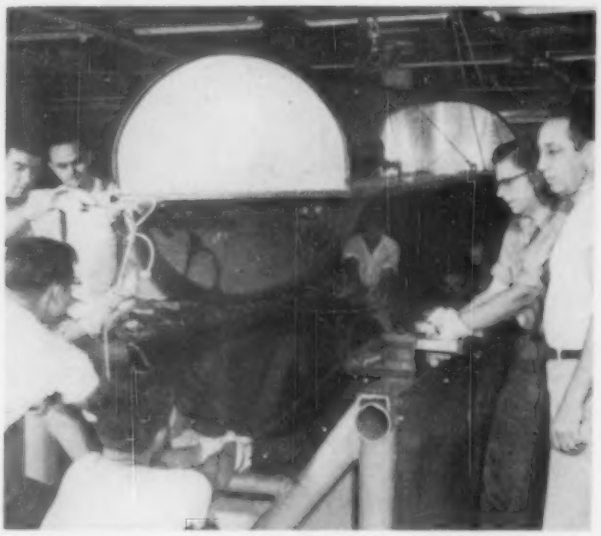
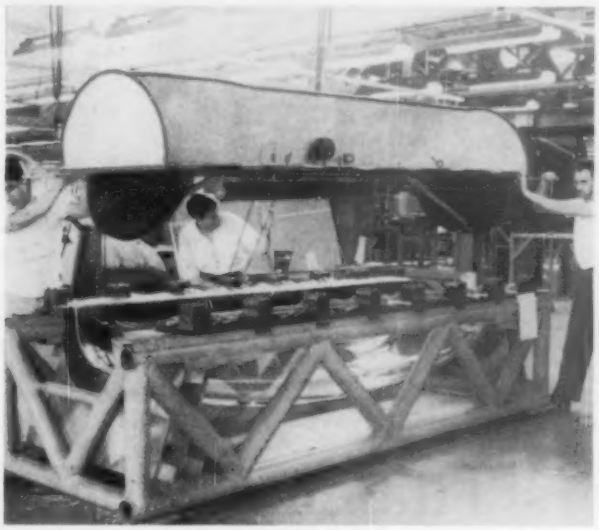
How Goodyear Produces B-47 Canopies

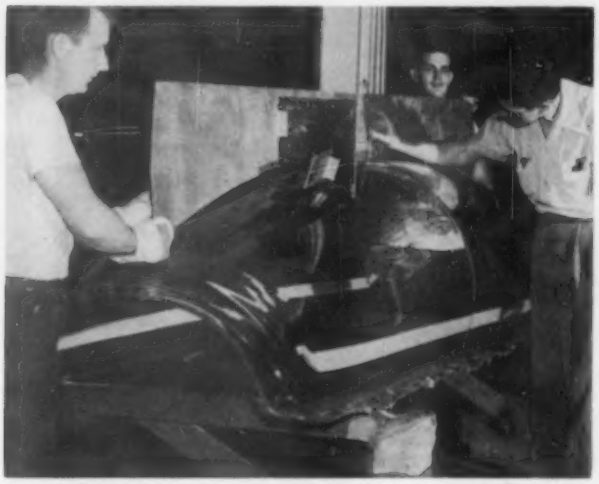
1. **GLOVE-CLAD** workmen lift flat layout of heated Plexiglas laminate for loading on fixture where shape will be blown at Goodyear Aircraft Corp. facility at Akron, Ohio.



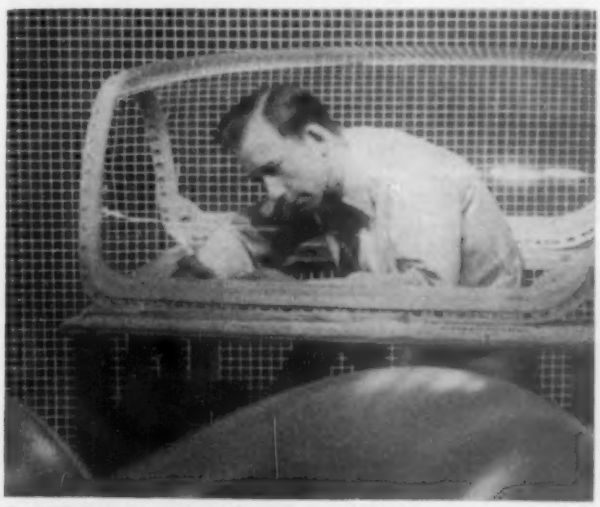
2. **IN BLOWING JIG,** sheet is held in place by pressure-lid bulkhead. Compressed air blows sheet into canopy shape.



3. **FORMED CANOPY** is seen in upside down position in jig as pressure lid is raised. Canopy is ready for removal.

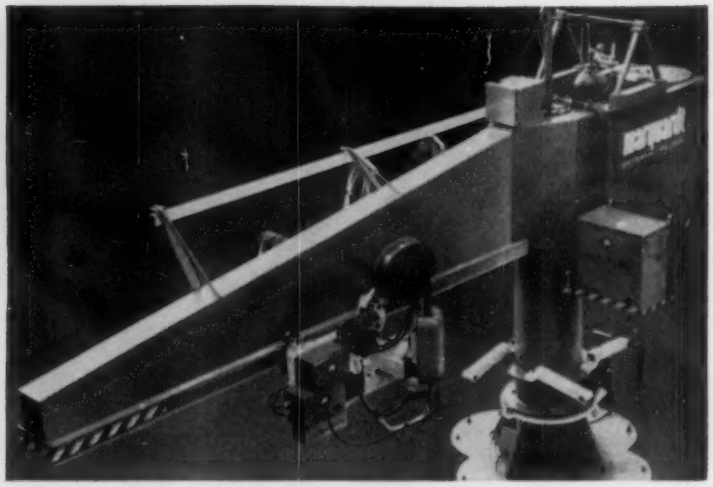


4. **CONTOUR TEMPLATE** is used to check if contour is within engineering drawing tolerance for aerodynamic smoothness.

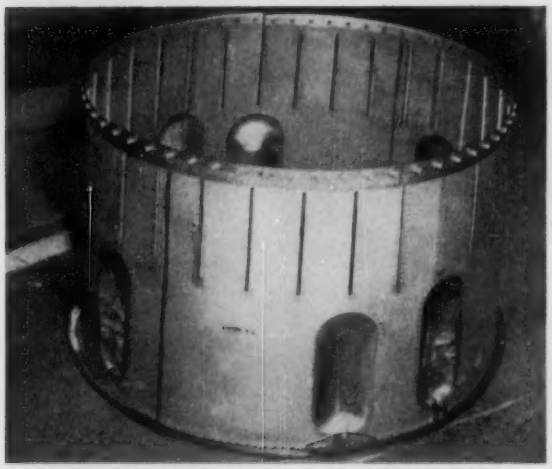


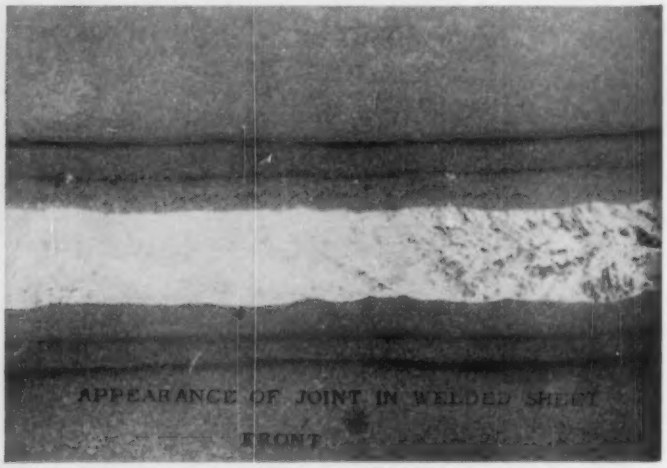
5. **OPTICAL INSPECTION** in front of grid board shows up any distortion. Canopy in this photo is for Republic F-84F.

6. **STOCKPILE OF B-47 CANOPIES** awaits trim or frame installation. Plastic coat gives scratch-protection.



MANUAL WELDING allows speed of about three inches/minute. Automatic device (right) will expand application of no-rod welding.





TURBOJET ASSEMBLY has long welds made without filler rod. Closeup of sample weld (right) shows only small trace of heat oxidization.

No-Rod Method Betters Titanium Welds

Important new titanium welding gains are said to provide ductility equaling or surpassing that of the base metal, considerably improving the quality of aircraft parts made from the new metal.

Basically, the process involves joining titanium sheets without using filler rod.

Since there is said to be no need for grinding titanium beads in this new process, the problems connected with this requirement have been eliminated. Normally, titanium weld-bead grinding causes severe wear on abrasive wheels and takes some time. Also, overheating at the joint can result in localized embrittlement of the weld that can cause failure.

▶ **Afterburner Production**—The no-rod technique has been used in fabricating a turbojet afterburner shroud. The joints have been tried in limited production and are now performing successfully in service applications, it is reported.

To date no-rod welds have been used principally on longitudinal tight-butt joints made manually in commercially pure titanium 0.062-in. thick or thinner. However, it is felt that with further development and the use of new automatic universal Heliarc welding machines, titanium can be welded in any shape and over a wide range of thickness without adding filler rod. Both commercially pure and weldable alloys will be suited to the new process.

The method was developed by the Materials & Process Laboratory at Marquardt Aircraft Co., Van Nuys, Calif. A paper detailing the process has been prepared by Alan Levy, supervisor of the company's Materials & Process Section and Robert Wickham, welding engineer.

The paper was delivered recently by Levy to the Los Angeles section of the American Welding Society. The paper was scheduled for another presentation at the Western Metal Congress, sponsored by the American Society for Metals in Los Angeles last week.

▶ **Major Improvement**—No-rod titanium welding's major improvement is the reduction in contamination from the surrounding atmosphere, enhancing the weld's ductility. Levy and Wickham point out that the oxide layer on the rod itself also is eliminated.

Even initial experiments resulted in weld color being silvery, indicating a minimum of contamination from the air.

Marquardt researchers realized after subsequent testing that joint properties could be improved considerably by modifying the welding variables. These include the configuration and material used in back-up bars, the effect of hold-down or chill bars, metal cleaning methods, welding machine settings, and the effects of argon gas flows on the face and bottom of the weld.

• **Effect of back-up bar** materials and configuration: Original tests used a

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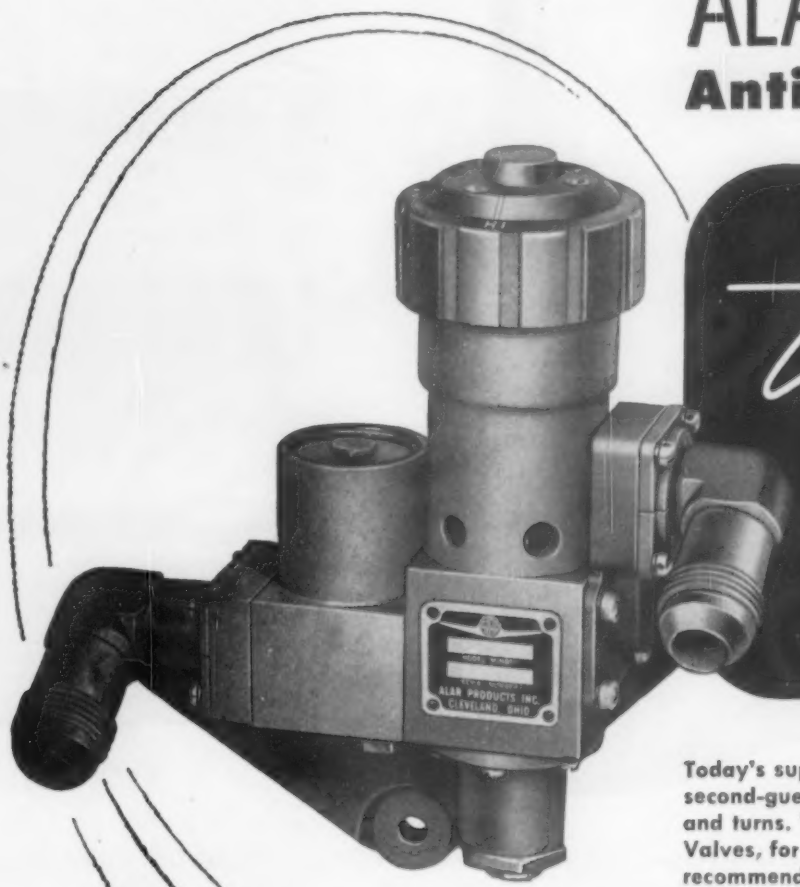
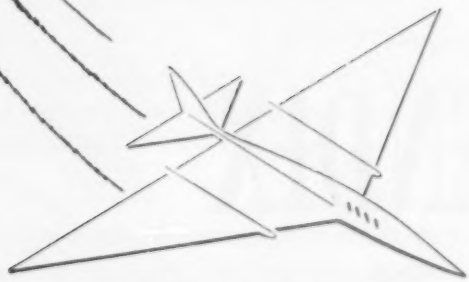


think
FOR THE
pilot



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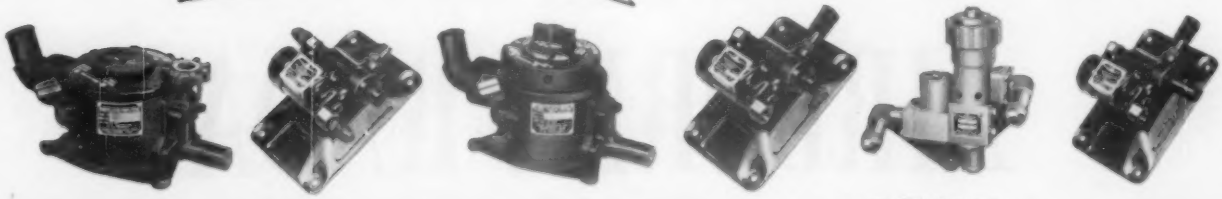

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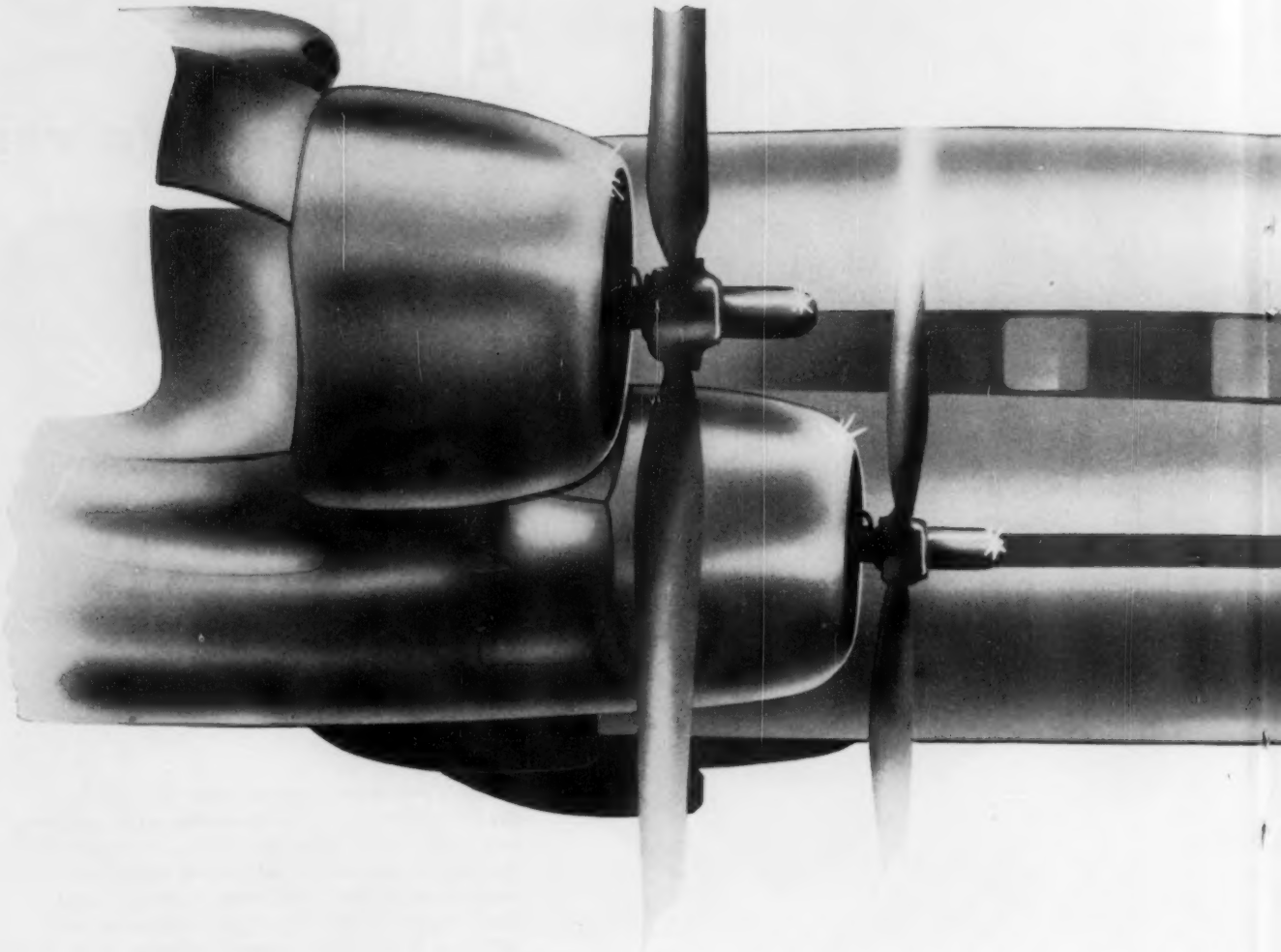

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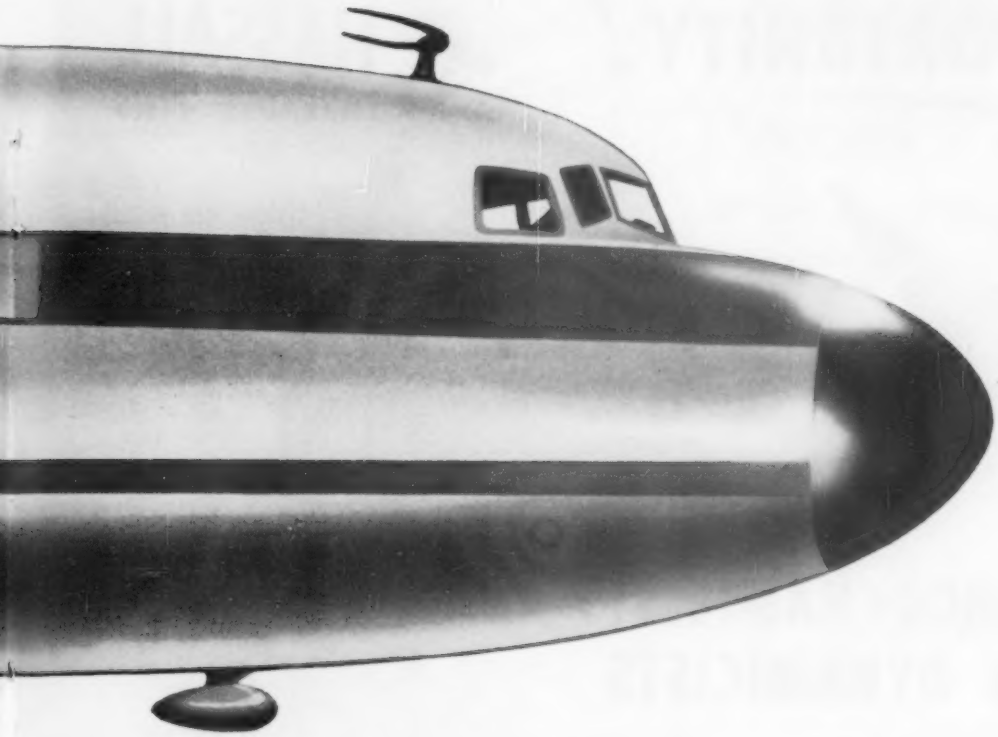

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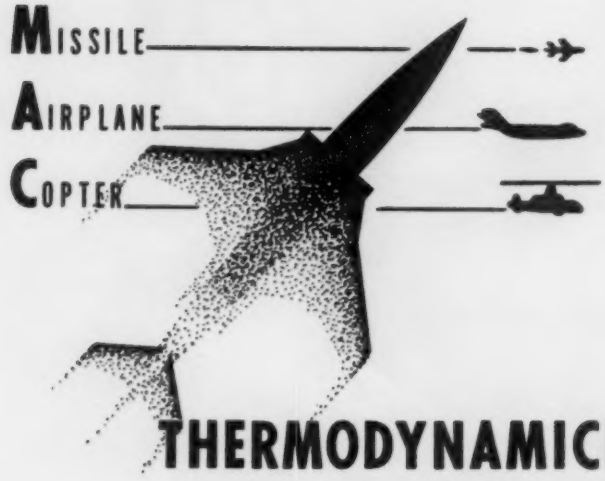

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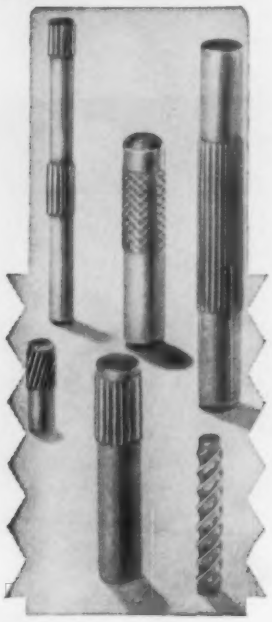

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copper back-up bar with a ¼-in. x ⅛-in. U-shaped groove.

It was recognized that the titanium built up a smut on the copper back-up bar that eventually contaminated the weld metal. Comparative trials were run using the copper bar and a mild steel back-up bar of the same configuration.

It was realized that the high conductivity copper bar was sapping sufficient heat from the weld to require an increased current setting; by doing this, weld contamination increased. The mild steel bar's low thermal conductivity retarded the chilling effect of the back-up bar enough to allow the operator to reduce the current setting, and the resulting lower heat level gave less contamination.

The investigation was extended to determine the effect of the shape of the groove in the bar. By varying its size and shape, Marquardt engineers noticed that they could vary heat transfer characteristics markedly. With "T" representing thickness of the metal being welded, tests showed that a rectangular groove 3T wide by 3T deep provided optimum conditions of partial preheating of the weld and of cooling the fused joint for maximum ductility.

To give the optimum thermal history to the weld, the low thermal conductivity of the back-up bar has to be balanced against a fairly rapid type of back-up groove, they note.

Thickness of the back-up bar was 0.5 in., although they report that varying the thickness had no effect on the weld.

• **Hold-down or chill bar** used in original tests was ½-in. thick by 2½-in. wide, the weld side being chamfered at a 45-deg. angle to ⅛-in. thickness. Only modification found necessary was to chamfer the weld size to ⅛-in. thickness, enabling hold-down bars to be placed closer to the actual weld joint. The closer the bars were placed to the joint, the narrower the heat-oxidized zone appeared on each side of the weld. By optimum spacing of these bars, it was possible practically to eliminate the typical blue oxide color that occurs in the base metal adjacent to the weld.

Chill bars have to clamp tightly to the work to produce the desired effect on the heat pattern in the joint during and after welding.

▶ **Cleaning Methods**—Marquardt learned that welding as-received titanium is not satisfactory. It worked out two recommended procedures:

• **Wire brushing,** using a stainless steel article, practically eliminated oxygen and oxide contamination and is superior to acid pickling.

• **Acid pickling** uses a four percent hydrofluoric acid and 40% nitric acid bath. The metal is dipped for the

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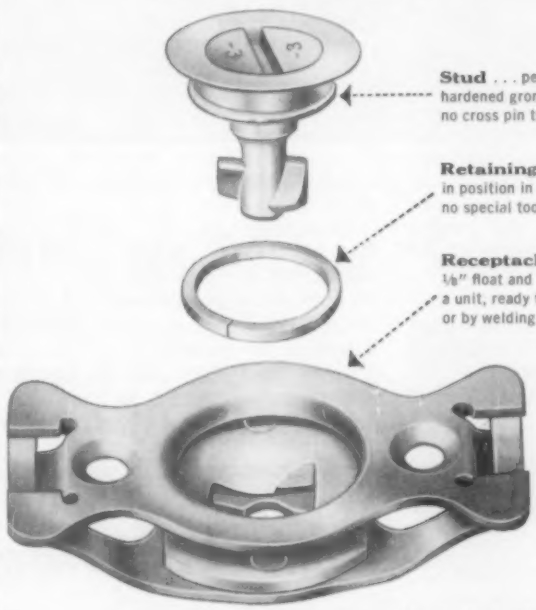

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time required to visually remove scale, withdrawn and rinsed in cold running water, followed by a hot-water rinse to speed drying. Time in the acid bath varies from one minute to 15 minutes depending on the bath's chemical activity.

► **Other Techniques**—To keep embrittling gases from entering the weld to a minimum, lowest possible current setting or heat input was used on the welding machine.

The machine is a P & H 200 HF-GW in conjunction with an HW No. 4 Linde torch and a No. 8 ceramic cup and a 1/16-in.—2% thoriated tungsten electrode.

• **Argon flow effects on weld face.** Since no filler rod penetrates the argon gas distribution around the weld puddle, a more effective, unimpaired blanket is created that flows around the actual molten zone in a more symmetrical pattern.

Gas pressure setting is critical, the Marquardt engineers report, and it varies with metal thickness and machine setting; the higher the current and the thicker the material, the greater the gas flow.

Too high a pressure creates two undesirable conditions. The fused joint has concave face areas due to the weld being depressed by the gas. Also, the close proximity and configuration of chill-bars produces a valley in the joint region.

High argon pressure creates a gas flow pattern that tends to roll contaminating air into the joint. The effect of the argon pressure out of the ceramic cup is stated to be particularly important in material of 0.50-in. and thicker. On 0.40-in. material, the flow rate was reduced to 12-cfh.

• **Argon flow effects on weld bottom.** Key to welds of the fused no-rod type is gas pressure on the weld's root side. Back-up pressure has to be closely controlled and regulated to the metal thickness.

Marquardt found that optimum flow rates vary from one cubic-foot-per-hour to five cubic-feet-per-hour for each six inches of joint length. For 0.40-

Conditions for Welding Without Filler Rod

• **Welding Machine:** P & H 200 HF—GW with Linde H.W. No. 4 or 10 torch, No. 8 ceramic cup and 1/16-in. —2% thoriated tungsten electrode.

• **Back-up-bar:** 0.5-in. thick mild steel with rectangular groove 3T deep x 3T wide (T is thickness of metal to be welded). One-eighth-inch holes for argon back-up gas placed about six inches apart along the base starting two inches from the edge of the sheet.

• **Hold-down bars:** Mild steel bars ½-in. thick x 2½-in. wide chamfered on the weld side at 45 deg. to 1/16-in. thick. Clamp bars as close as possible to the weld.

• **Cleansing:** Metal should be either rubbed with a stainless steel brush prior to welding or pickled in a four-percent hydrofluoric acid, 40% nitric acid bath for 1-15 min. until scale is visually removed.

• **Machine setting:** As low as possible to produce 100% penetration. For 0.40-in. titanium: current 25 amp.; voltage 25 amp.; d.c., straight polarity.

• **Argon gas flows** through the welding torch, 12 cfh. for 0.40-in. titanium, and varying with other thickness. For back-up groove, 1-2 cfh. for each six inches of joint length of 0.40-in. titanium, varying with other thickness.

• **Manual welding speed:** Approximately three inches per minute for 0.40-in. titanium.

Metal having a sheared surface, resulting in a no-gap joint, is required for a satisfactory weld.

Capital Airlines

VISCOUNT

POWERED BY ROLLS-ROYCE

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The Vickers Viscount is manufactured by Vickers Armstrongs Limited

ROLLS-ROYCE AERO ENGINES FOR SPEED AND RELIABILITY

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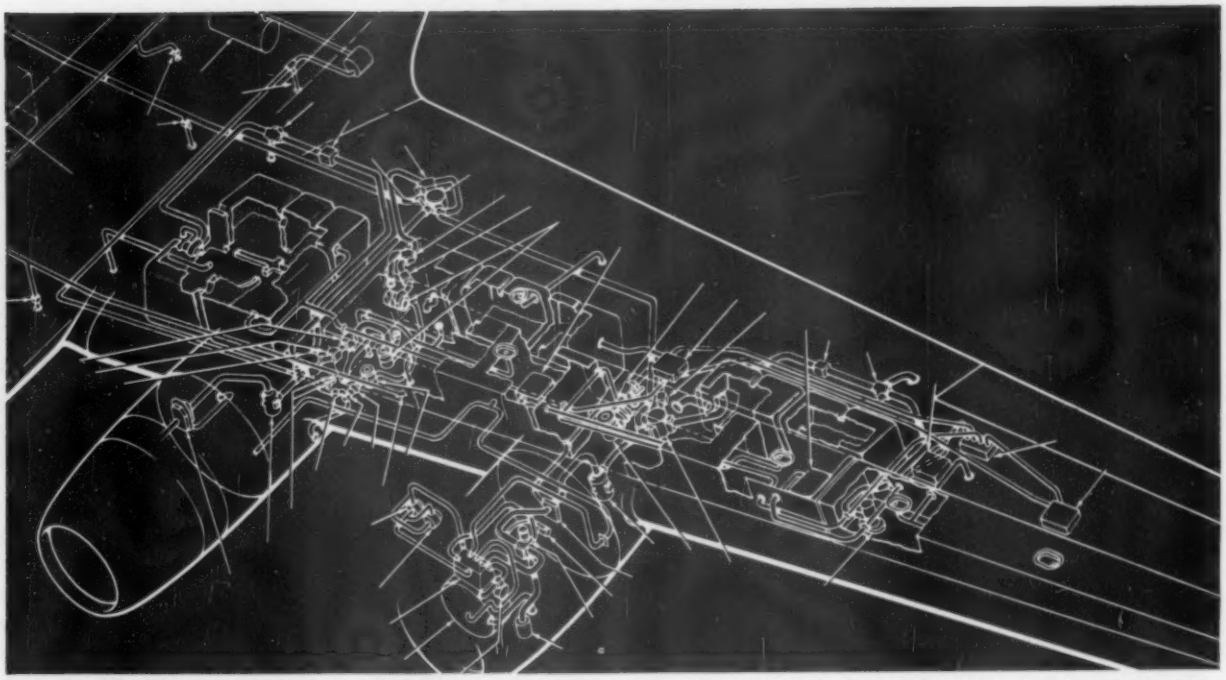


THE MODERN AIRCRAFT is a maze of tubing, serving such varied purposes as ignition harness, hydraulic lines, air conditioning and refrigerant lines, instrument parts, fuel and oil lines—and consequently demanding widely varying properties.

Why Aircraft Manufacturers Specify "Superior" Tubing

"Superior" Tubing meets all these requirements: light weight; close tolerances; workability; ability to withstand vibration, shock, high temperatures, and high pressure surges.

A complex modern aircraft requires a wide variety of special-purpose tubing in many different sizes and alloys. Strict specifications control chemical analysis, physical and mechanical properties, tolerances, uniformity and cleanliness. Here are a few of the problems which SUPERIOR tubing has successfully solved—

Severe Fabrication. Flexible metal hose in ignition harness tubing, bellows in fire detection thermocouples, hydraulic lines which must be able to be bent and flared without flattening and fracturing.

Ability to Withstand High Temperatures. Check valves for use in the water-alcohol injection systems of jets, fuel and oil lines forward of the firewall, jet probes (pitot tubes), thermocouple tubes.

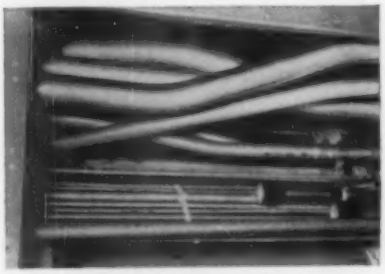
Ability to Withstand Pressure Surges, Vibration and Shock. SUPERIOR hydraulic tubing withstands bursting pressures as high as 12,000 psi.

Light Weight. Structural parts made from the new, lightweight, high-strength metal titanium. Very thin wall (.010"), large diameter (up to 2½") seamless tubing for air conditioning ducts.

Close Tolerances. Alloy steel push rods for piston engines.

Surface Finish Uniformity. Inside diameter of fuel lines must be absolutely smooth to avoid turbulence.

If *you* have a problem involving the production of high-quality aircraft tubing, SUPERIOR can undoubtedly solve it. Write SUPERIOR TUBE COMPANY, 2038 Germantown Ave., Norristown, Pa. *On the West Coast:* Pacific Tube Company, 5710 Smithway St., Los Angeles 22, Calif.



HYDRAULIC TUBING IN A DC-6. "Superior" makes over 55 analyses in carbon, alloy and stainless steels—nickel and nickel alloys—beryllium copper, titanium, zirconium. Sizes range from .010" to ⅛" in diameter, and certain light walls up to 2½" in diameter.

BASIC INFORMATION for your design engineers is contained in this 8-page booklet—"A Guide to the Selection and Application of Superior Tubing." Contains technical and application data on standard alloys. Send for your free copies today.

Superior Tube

The big name in small tubing

TWIN J-57s POWER THE

NEWEST FIGHTER and the first with two J-57 engines, is this new "century series" Air Force fighter being tested at Edwards Flight Test Center in California. The big, long-range McDonnell F-101 is 67 feet in length and has a wing span of 39 feet.

PRATT & WHITNEY AIRCRAFT
DEPENDABLE ENGINES

ONE OF THE DIVISIONS OF
UNITED AIRCRAFT CORPORATION

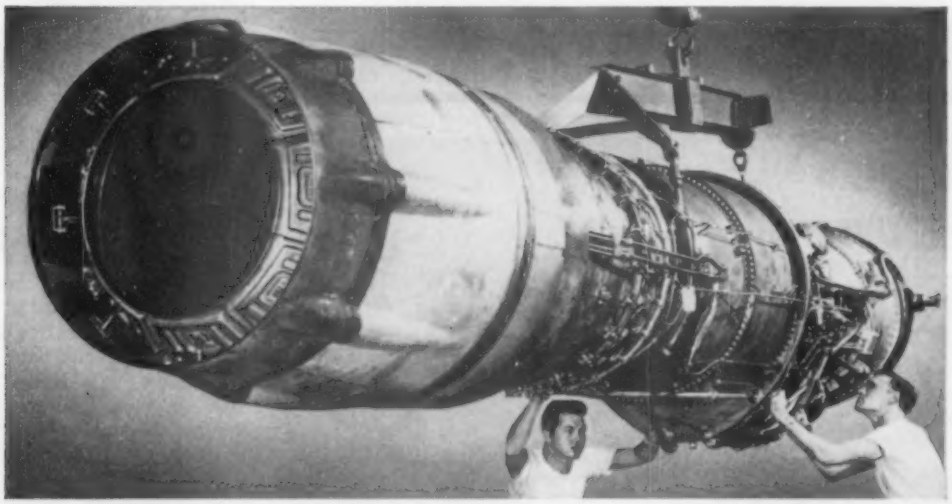
NEW VOODOO FIGHTER

The most powerful jet fighter ever built in America—the first with two J-57 turbojets—is joining the U. S. Air Force's supersonic team of "century series" fighters.

It is McDonnell's F-101 Voodoo, a long-range fighter-bomber capable of carrying atomic weapons and slated for service with the Air Force's Strategic Air Command.

Like its supersonic sisters, the F-100 Super Sabre and the delta-winged F-102, the F-101 Voodoo is designed to take full advantage of the tremendous thrust provided by Pratt & Whitney Aircraft J-57s and their afterburners.

In the new Voodoo, Pratt & Whitney Aircraft's J-57 continues to make its vital contribution to American Air Power.



OVER 20,000 POUNDS OF THRUST and outstanding fuel economy are available in the F-101 from twin P&WA J-57s and special afterburners, like that on the J-57 shown above. They are about two feet shorter than other J-57 afterburners. This engine equipment makes the long-range Voodoo the most powerful fighter known today.

Pratt & Whitney Aircraft

MAIN OFFICE AND PLANT: EAST HARTFORD, CONNECTICUT • BRANCH PLANTS: NORTH HAVEN, SOUTHINGTON, MERIDEN
In Canada: Canadian Pratt & Whitney Aircraft Co., Ltd.

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RUBBER TECK'S DUO-SEAL

The ONE PIECE, permanently bonded "O" ring and washer

Duo-Seal, a one-piece washer with permanently bonded "O" ring, provides leakproof bolt sealing against fluids and gases through walls, bulkheads or skins.

Duo-Seals are color coded for fuel and general purpose; high temperature, and oil. Impervious to atmospheric elements, salt water, gasoline, oil and most organic solvents. Available in sizes for #4 screw to 2" nominal bolt diameter.

OTHER RUBBER TECK PRODUCTS: Flexible Breakaway Connectors • Flexible Hot Air Duct Connectors • Flexible Fluid Line Connectors • Rigid Duct Connectors.

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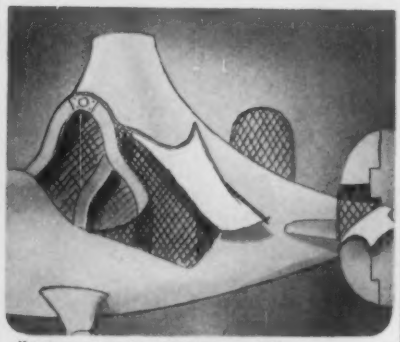


"Celastic" being used for quick, economical mockup construction.

WE'VE GOT A BOOKLET DESCRIBING

Celastic "the miracle plastic"

just waiting for your letter of request! This is the fabulous plastic that you cut from soft sheets, soften in a liquid softener, mold or shape any way you want and let it harden—that's all! "Celastic" has a million uses, you'll be interested in at least one of them. So, write now for your copy of this free booklet, it will be sent to you by return mail.

reg. U. S. Pat. Office
a colloid treated fabric

SKYLINE PRODUCTS INC.

GRAND BOULEVARD, DEER PARK, NEW YORK

in. material, flow rate was reduced from 10 cfh. in early trials to 1-2 in the final tests.

Such low pressures made it important to provide proper distribution of the argon along the back-up groove. Here gas ports were spaced six inches apart, the first port located about 2 in. from the edge of the sheet. Also, length of the individual argon tube to each port became critical. In order to equalize gas pressure over the entire weld, all tubes had to be the same length from gas manifold to the ports.

▶ **Microstructure Comparison**—A metallographic study of welds made without and with filler metal show some marked differences in their microstructures.

• **When filler rod is used** the weld's microstructure consists of a typical coarse-grained basketweave alpha structure, an area in the heat-affected zone of coarsened grains of acicular alpha and a base metal structure of fine-grain equiaxed alpha with some acicular alpha.

• **With the no-rod technique,** there are two prime differences, the Marquardt engineers note. Area of the coarsened acicular alpha structure in the heat-affected zone is smaller and more sharply defined and there appears to be some needles of retained beta in the fused-zone basketweave alpha. These provide evidence of the lower heat input and resultant faster cooling common to this method.

Electronic Meter Spots Faulty Bonds

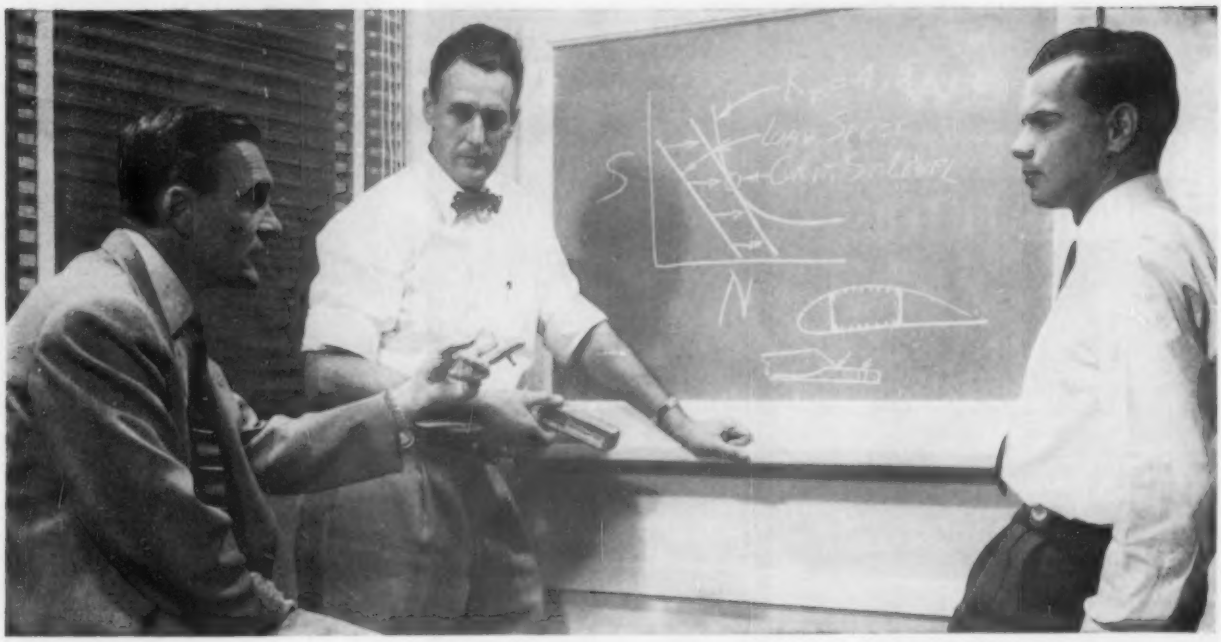
Convair-Ft. Worth inspectors check adhesive-bonded metal components with two new electronic meters that not only spot faulty bonds but diagnose the trouble too. Both units use mechanical impedance principles, the degree of vibration telling the story.

The Convair devices, called STUB meters (Stanford Testing Ultrasonic Bond), are based on a Stanford Research Institute development initiated by Air Force's Wright Air Development Center.

The STUB meter provides an inspector with "go, no-go" type of operation, even with a minimum of training, Convair says. The inspector spreads a thin oil film on the panel to be tested. He then runs a ceramic crystal over the panel's surface. The crystal is excited by means of a high-frequency oscillator at a resonant frequency of 400,000 cps., the test section vibrating at the frequency of the crystal.

The crystal's electrical properties permit it to receive and transmit electrical energy. Amplitude response is shown on an oscilloscope. The better the bond the less the vibration.

If the panel does not pass inspection



J. F. McBrearty, chief structures engineer (left), discusses fatigue test program of integrally-stiffened wing lower surface structure of Super Constellation Model with E. H. Spaulding, structures division engineer and J. G. Leewolt, stress engineer. Lockheed's 500,000 lb. Force Fatigue Machine was used in test program.

Advanced structures facilities speed careers of Lockheed Engineers

Ralph Oliva, research engineer, examines Super Constellation skin for signs of fatigue failure.

Engineers in Lockheed's Structures Division are supported by unmatched research and testing facilities in their constant effort to increase strength while decreasing weight.

Among those facilities are the Lockheed-designed 500,000 Lb. Force Fatigue Machine, first of its size; Shimmy Tower, only one in private industry; and Drop Test Tower, largest in the nation.

Facilities such as these give engineers a major advantage in making technical advances – and thus advancing their careers. Moreover, the large number of projects always in motion at Lockheed mean continuing opportunity for promotion as well as job security.

Why Lockheed needs Engineers with Structures training:

1. **"Fail-Safe" Structures** – Lockheed has begun an extensive pioneering effort in the new concept of "fail-safe" structures. Studies are being applied to virtually all phases of Lockheed's diversified development program – already the largest in the company's history.

2. **New studies in:** Effect of high temperatures on structures; optimization of thin-wing designs and other aero-elastic problems; new materials such as ultra-high heat treat steel; panel instability at extremely high speeds.

Engineers interested in the "Fail-Safe" program and other studies are invited to write E. W. Des Lauriers, Dept. S-3-4.

Lockheed
AIRCRAFT CORPORATION
BURBANK, **California**

New
HIGH INSERTION LOSS NOISE FILTERS

Now Sprague brings you a complete series of miniaturized, bulkhead-mounting interference filters for aircraft and mobile electrical and electronic equipment in ratings from 0.1 ampere to 20 amperes for both 125 volt dc and 125 volt ac, 400-cycle service. These filters meet all pertinent MIL and AN requirements for operation at temperatures from —55°C to +85°C. All designs are hermetically sealed with glass- or ceramic-to-metal solder seal terminals.

These filters are available to meet *your* production schedules from the West and East coast plants of a reliable, old-line manufacturer. For Engineering Data Sheets on the units in which you are interested, write today to the Technical Literature Section, Sprague Electric Company, 11325 West Washington Blvd., Los Angeles 66, California, or 327 Marshall St., North Adams, Massachusetts.

SPECIFICATIONS

RATING		CATALOG NUMBER	CHARACTERISTICS							
CURRENT (AMPS)	VOLTAGE FREQUENCY		WEIGHT (OZS.)	SIZE (DIA." X LENGTH")	INSERTION LOSS (DB) AT GIVEN FREQUENCIES (MC) (50 OHM SYSTEM)					
					.15	.5	1	10	100	400*
0.1	125VDC	1JX54	1.5	3/4 x 1 7/8	63	100	100	112	>84	>80
1	125VDC	1JX36	2	25/32 x 2 1/4	56	81	>100	86	>90	>73
1	125V/400CY 400VDC	1JX42	5	31/32 x 2 15/32	50	79	96	97	80	>56
5	125V/400CY 400VDC	5JX15	6.5	1 7/32 x 3	60	90	>112	100	>70	>70
5	125VDC	5JX18	3.7	31/32 x 3 1/4	59	89	> 95	>105	>90	>73
10	125V/400CY 400VDC	10JX15	8.5	1 13/32 x 3 13/32	59	88	>100	87	>80	>79
10	125VDC	10JX16	7.5	1 7/32 x 3 1/4	74	106	>109	>113	>93	>81
20	125VDC	20JX14	9	1 11/32 x 2 15/16	57	88	>103	> 99	>90	>83
20	125V/400CY 400VDC	20JX15	10	1 5/8 x 3 13/32	56	88	>100	>114	>83	>60

*Beyond the range of measurement

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WORLD'S LARGEST CAPACITOR MANUFACTURER

OSCILLOSCOPE TRACE shows whether honeycomb bond is good or not.

it is sent to the laboratory for check by another STUB meter. Interpretation of the oscilloscope's different wave forms indicates the types of defects, such as undercuring contamination and the like.

Convair-Ft. Worth engineers responsible for STUB meter development are R. M. Cunningham, E. L. Gray, C. E. Horn and J. L. Stribling. The work at Stanford was handled by James S. Arnold.

Navy Contracts

Contracts recently announced by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11, are:

B. F. Goodrich Co., 500 So. Main St., Akron 18, Ohio, tube assys., 2,766 ea., $53,494.

Bakelite Co., 30 E. 42nd St., New York 17, N. Y., resin, 108,000 lb., $41,040.

Bruning Bros., Inc., 4209 E. Chase St., Baltimore 5, Md., deck paint, 20,000 gal., $25,800.

Cornelius Co., 550 39th Ave., N.E., Minn., Minn., maintenance parts used on compressors, $238,965.

Kell-Strom Tool Co. Inc., 214 Church St., Wethersfield, Conn., tools, adapters, used for repair of various aircraft, engines, 44 ea., $26,135.

Kiekhaefer Corp., 157 Western Ave., Cedarburg, Wis., starters, target drone engine, 46 ea., $44,277.

Lord Mfg. Co., 1635 W. 12th St., Erie 6, Pa., mount assys., 3,273 ea., $215,462.

M. B. Mfg. Co., Inc., 1060 State St., New Haven 11, Conn., vibration exciter, 1 ea., $91,682.

Pervo Paint Co., 6624 Stanford Ave., Los Angeles 1, Calif., enamel, 36,500 gal., $70,430; deck paint, 29,600 gal., $37,652.

Pesco Products Div., Borg-Warner Corp., 24700 North Miles Rd., Bedford, Ohio, services and material for fuel pump assys., $45,748.

Vickers, Inc., Div. of the Sperry Corp., 1400 Oakman Blvd., Detroit 32, Mich., services and material to overhaul pump assys., $27,600.

Westinghouse Electric Corp., 3001 Walnut St., Philadelphia 4, Pa., power units, 62 ea., $147,095.

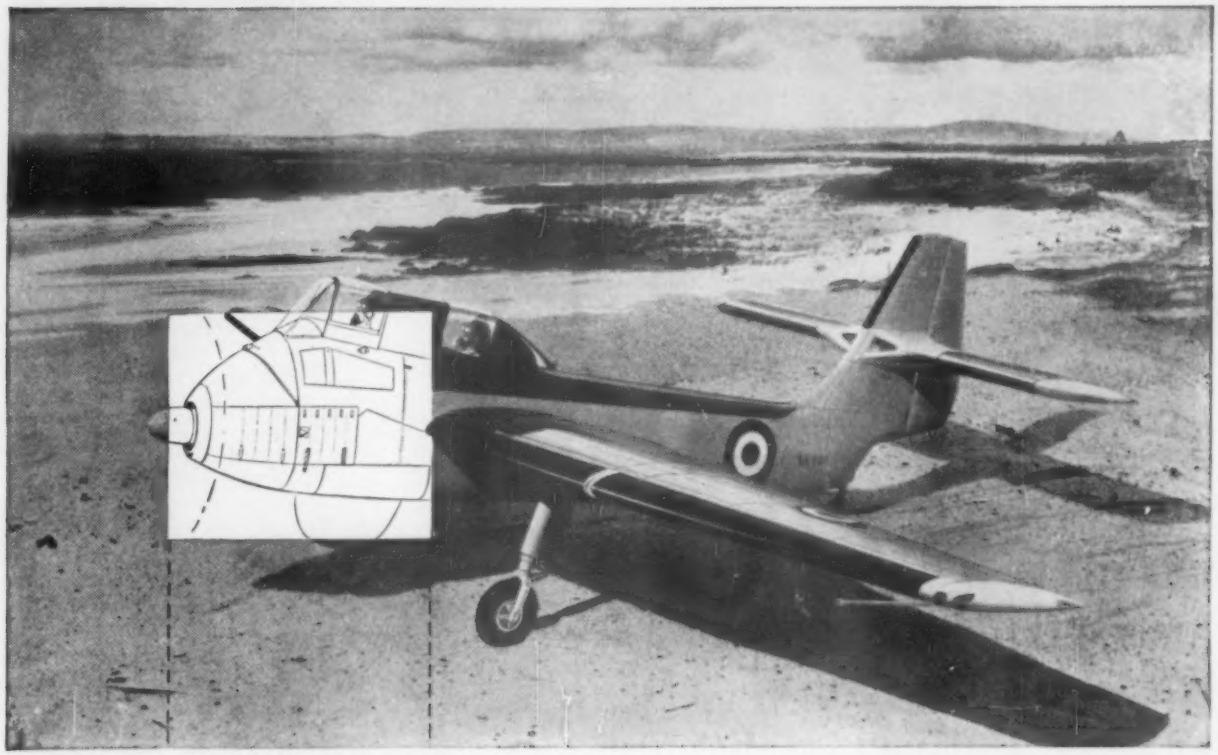
Atlas Paint and Varnish Co., 32-50 Buffington Ave., Irvington 11, N. J., paint: oil, exterior, 29,900 gal., $56,403.

B. F. Goodrich Co., 500 So. Main St., Akron 18, Ohio, deicer boots, $133,962.

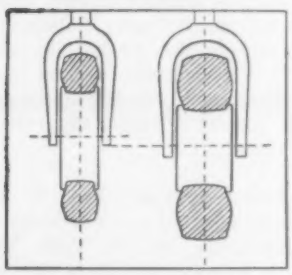
B. F. Goodrich Sponge Products Div., Howe Ave., Shelton, Conn., ring buoys, $122,140.

Bendix Products Div., Bendix Aviation

Sand strip – *Seamew* base

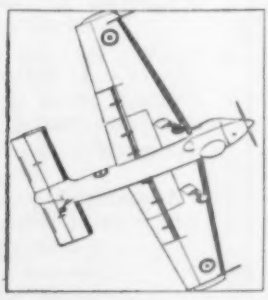


Simplicity of design ensures simplicity of maintenance—and economy in initial cost and in use of spares and manpower. Removable panels make components easily accessible.



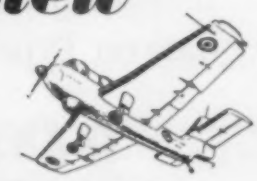
The wheels of the Seamew can be swiftly changed, with differing sizes of tyre to suit the surfaces from which it operates.

Seamew —a tough, economical, all-weather submarine hunter. Airborne in a short distance from any rapidly constructed airstrip—or even a stretch of beach—the Seamew can conduct a maritime search with up-to-date radar equipment and use a variety of weapons to effect a kill. Its high manoeuvrability, low stalling speed and fixed shock-absorbing undercarriage enable the Seamew to land back safely after operating in weather conditions impossible for other anti-submarine aircraft.



The *Short* answer is the *Seamew*

Generous flap surfaces contribute to the very low stalling and landing speeds. The Seamew requires the minimum length of runway on emergency airstrip or escort carrier deck.



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Short Brothers & Harland Ltd., Queens Island, Belfast, N. Ireland. The first manufacturers of aircraft in the world

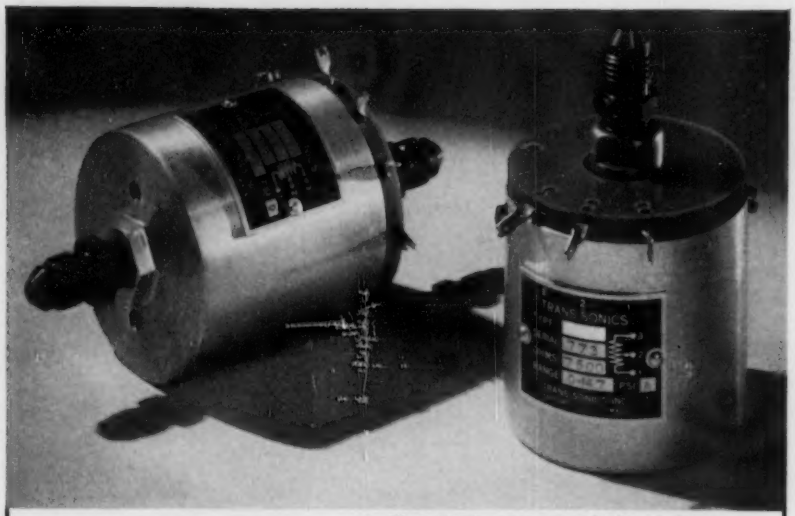

Illustration is approx. two-thirds actual size

PRESSURE TRANSDUCER FOR USE UNDER SEVERE VIBRATION

THE TRANS-SONICS TYPE 75 PRESSURE-OPERATED POTENTIOMETER will operate satisfactorily while subjected to ±25 G vibration at any frequency up to 2000 cycles per second.

This is 2½ times the acceleration and 4 times the frequency range of Paragraph 4.7.1, MIL-E-5272A.

No vibration mounts or other trouble causing gadgets are employed to accomplish this. The resistance to shock and vibration is built in the instrument mechanism itself. For further information request technical data on Type 75 BARORESISTORS.

TRANS-SONICS, INC.

7 FOREST STREET, BEDFORD, MASS.

Corp., South Bend, Ind., maintenance parts for various aircraft, $26,127; maintenance parts for injection and float, $88,624.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., bearings, 20,240 ea., $26,514.

Erie Mfg. Co., 4000 South 13th St., Milwaukee 15, Wis., cylinder assys., 2,100 ea., $61,597.

Goodyear Tire & Rubber Co., Inc., 1144 East Market St., Akron 16, Ohio, ring buoys, $126,798.

Hammond Mfg. Co., 3600 E. Foothill Blvd., Pasadena 8, Calif., cradles, lightweight and kits, $78,992.

Hoboken White Lead & Color Works, Inc., 1501 Adams St., Hoboken, N. J., paint, deck, red, 42,100 gal., $64,775.

J. A. Otterbein Co., River Rd., Middletown, Conn., link connectors, $30,225.

Loral Electronics Corp., 794 East 140th Street, New York 54, N. Y., services to overhaul frequency meters, $44,825.

M & M Precision Products Corp., 412-55 Street, Brooklyn 20, N. Y., cork assys., $26,587.

Rochester Optical Mfg. Co., Inc., 38 Scio St., Rochester 4, N. Y., goggle sets, 48,500 set, $83,905.

Sears Roebuck and Co., Paint and Varnish Factories, 4820 Langdon St., Phila. 24, Pa., paint; deck, red, 40,000 gal., $64,800.

Stewart Steel Products Inc., 1785 East New York Ave., Brooklyn 7, N. Y., engine stands, 78 ea., $28,782.

Hydro-Aire, Inc., 3000 Winona Ave., Burbank, Calif., maintenance parts for J57-P-9 engines, $49,937.

Lewis Engineering Co., 339 Church St., Naugatuck, Conn., indicator; spare parts, 2,342 ea., $80,167.

New York Air Brake Co., Watertown, N. Y., pumps, hydraulic, $282,340.

Pacific Scientific Co., 1430 Grande Vista Ave., Los Angeles 23, Calif., indicators, $27,569.

PRODUCTION BRIEFING

► **Rheostat that dissipates 3,300 kw.** has been built by General Electric Co.'s industry control department for a wind-tunnel at USAF's Arnold Engineering Development Center, Tullahoma, Tenn. Device weighs 40,000 lb. when full, will vary current passing into large heaters that regulate temperature of air passing through the tunnel's test section.

► **Prenco-Aeroquip, Ltd.**, Toronto, has been organized as a subsidiary by Aeroquip Corp., Jackson, Mich. The U. S. firm acquired all assets of Prenco relating to its flexible hose and self-sealing coupling business.

► **Robinson Aviation, Inc.**, Teterboro, N. J., has signed a contract with Port of New York Authority for construction of a 42,000-sq. ft. plant on the northeast corner of Teterboro Airport. The firm makes vibration control equipment.

► **Armament Components, Inc.**, is the new name of West Coast Tool & Supply Co., recently acquired as a subsidiary by Townsend Co., New Brighton, Pa., and moved from Los Angeles to the parent company's Cherry Rivet Div., Santa Ana, Calif. The subsidiary makes flexible chuting to feed ammuni-

1927—Covering wing of early Boeing plane, Seattle plant

1955—B-47 Stratojet assembly, Boeing Wichita Division

Boeing offers engineers long-range careers

Back in 1927 engineers designed airplane wings in simple terms of wood and cloth. An airplane wing of today is a complex aerodynamic structure housing a myriad of electrical, mechanical and hydraulic systems.

Yet many Boeing engineers of 1927 are still with the company. They have grown with the science of aviation—capitalized on its potentials, and contributed to its progress.

What engineer in 1927 could foresee the stature of the aviation industry today. They saw only a challenge—an opportunity—to create a future. If you seek similar challenge—limitless opportunity—and growth potential—you can find it at Boeing.

Boeing is seeking more engineers of ability—in Research, Design and Production. Today, one out of each seven Boeing employees is an engineer! You'll work on such diverse programs as: The B-52 and B-47 multi-jet bombers. The "707," America's first jet transport. Research in nuclear-powered and supersonic flight. One of the nation's major guided missile programs, the IM-99 Bomarc pilotless aircraft. Beyond that? Engineers will establish the future pattern.

Boeing has openings for virtually all types of engineers—electrical, civil, mechanical, aeronautical and related fields, as well as for applied physicists and mathematicians with advanced degrees.

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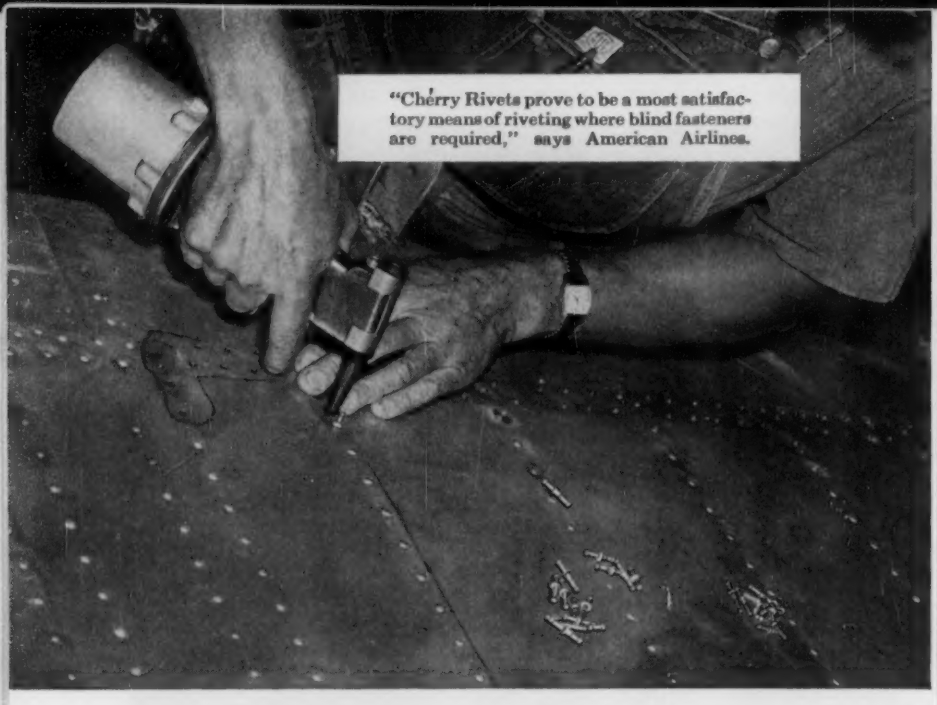
JOHN C. SANDERS, Staff Engineer—Personnel
Boeing Airplane Company, Dept. C-10, Seattle 14, Wash.

BOEING

SEATTLE, WASHINGTON WICHITA, KANSAS


"Cherry Rivets prove to be a most satisfactory means of riveting where blind fasteners are required," says American Airlines.

Cherry Rivets speed overhaul and repair at American Airlines Depot

Keeping the huge American Airlines' fleet in top operating condition is a big job that requires an excellent organization of skilled specialists, a variety of special equipment, a large stock of replacement parts—plus good fasteners such as Cherry Blind Rivets.

At American Airlines' Tulsa Overhaul and Supply Depot, for example, they say, "We have recognized the use of the Cherry Rivet and its application in the overhaul and repair of our equipment. Cherry Rivets are used in the overhaul of aircraft commissary equipment, passenger seats, secondary structure of control surfaces and engine cowling. They prove to be a most satisfactory means of riveting where blind fasteners are required."

Here and in other repair shops of the world's airlines, Cherry Blind Rivets provide a fast, safe, secure method of fastening. Their use speeds repair by eliminating the necessity of removing entire sections to gain access for replacement of damaged sections and parts. This gets ships out of the shop faster—puts them back on the payline quicker—helps keep operating expenses down.

Cherry Rivets are installed by one man from one side of the work by a special gun which pulls the stem into the hollow shank—upsets the end on the blind side—firmly clinches the rivet in place—fills the hole—all in a split second. Bucking is eliminated.

To learn how you can speed repairs and reduce maintenance costs with Cherry Blind Rivets in aircraft and other industries, write for Bulletin TL-76—it is yours for the asking.

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City_____ Zone____ State_____

tion and provide disposal of spent links and cartridge cases.

▶ **Closed-circuit TV** will be used to transmit pictures of graphs, parts and engineering reports and for conferences between Bethpage and Peconic River, N. Y., plants of Grumman Aircraft Engineering Corp. Also, a mobile TV camera will permit Bethpage personnel, 50 mi. from Peconic River, to watch tests at the latter plant.

▶ **M. H. Sweet Engineering Co.,** Binghamton, N. Y., plans to design and produce air navigation equipment, autopilots and do research and development on photo-electric measuring instruments. President of the new firm is Monroe H. Sweet, formerly of Ansco. Chief engineer is James Casterlin, previously with Ansco and Link.

▶ **Talley Machine & Manufacturing Corp.,** maker of electro-mechanical and pneumatic actuators and hot air valves for military planes, plans to build a factory, double its present 35,000-sq.-ft. facility, in Ventura County, Calif.

▶ **Hartwell Aviation Supply Co.,** Los Angeles, has opened a branch office in Ft. Worth. In charge is Howard Burch.

▶ **Bridgeport Thermostat Div.,** Robertshaw-Fulton Controls Co., is building a $2-million plant at Milford, Conn., scheduled for occupancy in July. The Milford plant will make metal bellows and automatic controls for these devices.

▶ **Hess, Goldsmith & Co., Inc.,** has established a Western Div. in Los Angeles to handle an increasing demand from aircraft and missile makers for fibre glass textiles. In charge of the new facility is Paul A. Erskine.

▶ **Fairchild Camera & Instrument Corp.** is building a 24,000-sq. ft. plant near Los Angeles. Occupancy is planned for June.

▶ **Modular-type high vacuum furnace** has been delivered to Mettalurgical Development Laboratory of Westinghouse Electric Co., Blairsville, Pa., by Consolidated Vacuum Corp., Rochester, N. Y. Westinghouse will initially operate the unit at 350-lb. capacity. By interchanging and adding equipment, the furnace can be expanded to 1,000-lb capacity without disturbing basic installation.

▶ **Dynamic Sales Enterprises, Inc.,** 103 Park Ave., New York, has been named by Fairchild Guided Missiles Div. as sales representative for electronic laboratory equipment and other industrial devices developed by the firm as a corollary to its missile electronics work.

Cold-Forming Tool Spins Metal Parts

Substantial savings in material and labor costs in the cold-forming of contoured metal components for use in high-temperature areas of turbojets are expected by Solar Aircraft Co. from use of a new 36-ton Hydrospin Machine recently shipped to the firm's San Diego, Calif., plant.

One $40 part, now made from a hemispherical casting which is then machined and welded, can be duplicated on the Hydrospin for $15, Solar says.

A major use for the machine will be in forming dome-shaped contoured components. Previously they had been fabricated in two sections and welded together, requiring special dies and fixtures. The Hydrospin will form them from a blank disk.

Solar states that on many parts, Hydrospinning takes only one-fourth as much material as used in forging procedures.

Parts made with the new machine also are claimed to have greater fatigue resistance than made with former methods, because the process provides shear deformation, resulting in work hardening the material and increasing tensile strength.

The Hydrospin unit rotates a metal disk at highspeed and two metal rollers force the metal onto a rotating mandrel into the desired shape while rollers advance it along a preset course. Except for loading and unloading, the machine is automatic.

HYDROSPIN rollers shape rotating part against rotating mandrel.

Made by Cincinnati Milling Machine Co., Ohio, the machine is valued at approximately $100,000.

A somewhat similar cold-contouring technique, called flow turning, was developed recently by Pratt & Whitney Aircraft (AW Sept. 13, 1954, p. 28).

ODM Grants Writeoffs For Aviation Facilities

Austenal Laboratories, Inc., Rockaway, N. J., has been granted a certificate of necessity by Office of Defense Mobilization for a military aircraft components facility costing $1,214,310, with 65% allowed for rapid tax amortization.

Other certificates recently issued include:

Precision Tool & Mfg. Co., Westfield, Mass., machining parts for aircraft and Atomic Energy Commission, $22,500 certified with 70% allowed.

H. W. Loud Machine Works, Inc., Pomona, Calif., military aircraft parts, $741,414 certified with 70% allowed.

Visioneering Co., Inc., Cleveland, ordnance components, $148,845 certified with 70% allowed.

Convair, Division of General Dynamics Corp., San Diego, research and development, $300,000 certified with 60% allowed.

Ethyl Corp., Edgemoor, Del., storage of anti-knock additives for aviation gasoline, $160,000 certified with 90% allowed.

Douglas Aircraft Co., Santa Monica, Calif., military aircraft, $290,000 certified with 60% allowed.

Aerojet-General Corp., Azusa, Calif., components for military end items, $517,989 certified with 50% allowed.

Lord Manufacturing Co., Erie, Pa., aircraft parts, $98,587 certified with 70% allowed.

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Locking Insert Permits Blind Fastening

New device increases flexibility in design of fastener installations; WADC to test it in F-86 'wet wing.'

Danbury, Conn.—Heli-Coil Corp. has developed a threaded, stainless steel insert with a squared bottom coil that acts as a screw lock.

The insert has been approved in certain sizes by Wright Air Development Center and is being used or considered for some of the country's latest jet aircraft, missiles and helicopters, including the Convair F-102, North American F-100, Sikorsky S-58 and Doman LZ-5, -7 and -8.

▶ **Eliminates Grippers**—By firmly seizing the bottom threads of a bolt, screw or stud, the screw-lock inserts eliminate use of lock washers, lock nuts and similar gripping devices in non-critical locations.

They are being considered for windshield designs for three Glenn L. Martin proposals entered in military design competitions and a windshield design for Republic's supersonic F-105.

▶ **Windshield Use**—The thread-locking devices have two advantages over comparable bolt-and-nut fasteners when used in windshield installations, according to Heli-Coil engineers.

• **Space saving,** which permits windshield posts to be made thinner, increasing glass area.

• **Better vision.** Because blind male fasteners may be used with the inserts, no nuts need be located in the defrosting hot air space sandwiched between outer and inner windshield panels. Smooth interior contour allows even air distribution across the entire windshield, assuring over-all defrosting with no blind spots, say Heli-Coil officials.

▶ **Good in Tanks**—WADC will soon slosh-test an experimental "wet wing" design for an F-86 incorporating approximately 400 Heli-Coil screw-lock inserts.

WADC spokesmen say that "the application provides a locking insert in a blind hole, thereby eliminating the potential fuel leakage point which normally exists in each fastener through the fuel tank boundary." Aero-Cal Division of Coast Proseal & Manufacturing Corp. designed and built a prototype section of integral fuel tank wing for thick-skinned, thin-wing, high-performance aircraft for this test.

▶ **Inspection Panels**—The screw-lock insert is proving useful in the attachment of inspection panels and covers for equipment such as avionic gear which have to be removed periodically for inspection or maintenance.

In such operations, bolts or screws are held tightly in place by the screw-lock insert yet the male members may be readily and quickly removed when necessary.

▶ **Advantages**—Company spokesmen say that their insert has two big advantages over comparable thread-locking devices:

• **It permits blind bolts** (in combination with counterbore and bushing) to be used in shear applications for the first time. The device's screw-locking action, derived from its specially formed lower thread, permits the elimination of lock washer-type of gripping device between the mating surfaces which the fastener is securing. This feature gives airframe designers greater flexibility in solving fastening problems.

• **On starting or break-away torque tests,** screw-lock insert's torque remains approximately constant after as many as 150 removals whereas specifications allow break-away torque to drop to from one-third to one-half of initial torque after 15 removals, Heli-Coil claims.

Here is what Spec. AN-N-5b calls out as sample minimum starting torque values for first and 15th removals, according to size: Size 10-32, 3.2 and 1.9 in.-lb.; ¼-24, 16 and 9.6 in.-lb.; ¼-20, 30.2 and 18.1 in.-lb.

Here are actual test results using a 10-32 Heli-Coil screw-lock insert: Initial starting torque of 6 in.-lb. on first removal dropped to 3 in.-lb. on 15th removal—but only because of wear on the male member. When bolts were replaced every 16th removal torque remained at 6 in.-lb. up to 150th removal.

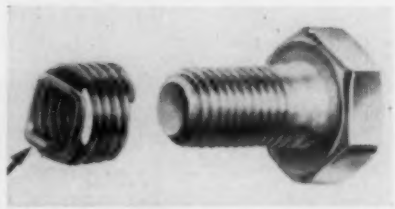
On another test, torque at the 150th removal actually exceeded that of the first removal because fastener used was a maximum tolerance bolt.

In still another test, the same bolt was used for all 150 removals. Result: starting torque dropped from 6 to 0.5 in.-lb. from first to last removal because of bolt wear.

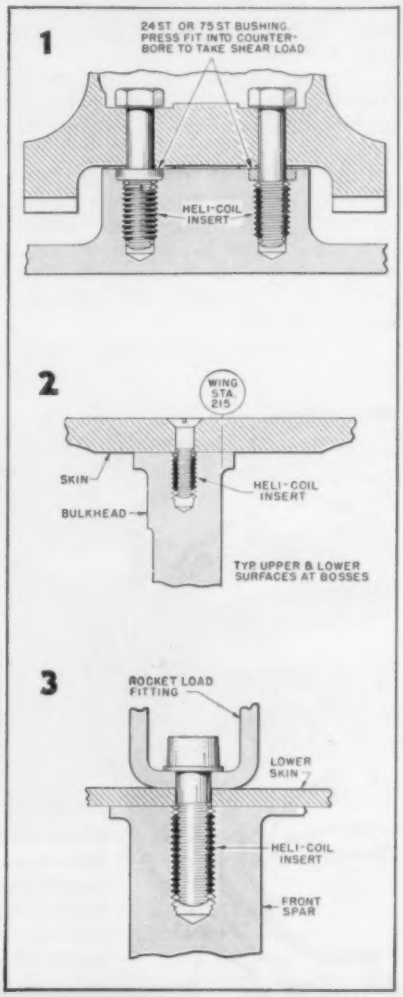
The inserts are designed to spec MIL-N-25027, which combines and supersedes specs AN-N-5b and AN-N-10a.

▶ **Four Other Categories**—This is how the screw-lock insert stacks up in the four other categories of tests listed in AN-N-5b (all tests conducted with size 10-32 bolt):

• **Torque-out** (torque-to-failure) tests show that the insert has a safety margin of approximately three-to-one over standard installation torque as spelled



SQUARED THREAD (arrow) seizes end of bolt, eliminating need for lock washer.



TYPICAL applications of new Heli-Coil insert on F-86 experimental 'wet wing' integral fuel tank: 1) in shear; 2) skin attachment; 3) skin-rocket load fitting.

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out in HIAD (Handbook of Instruction for Aircraft Designers), according

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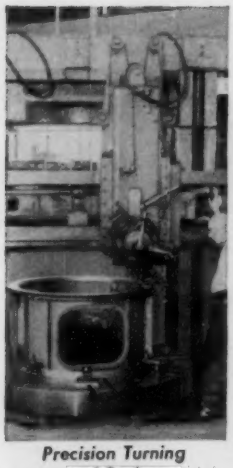
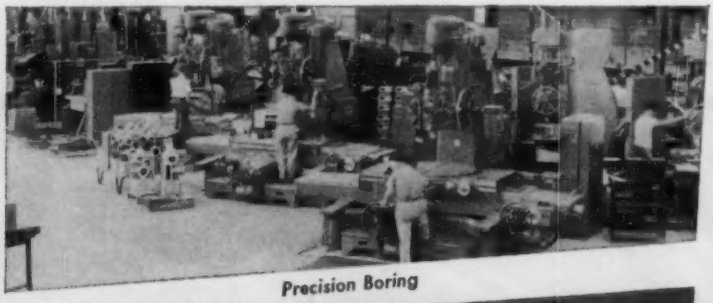
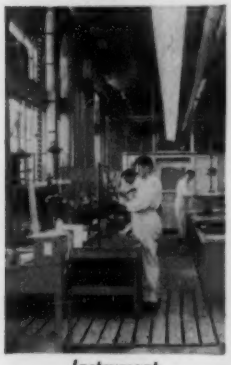


Precision Turning and Boring

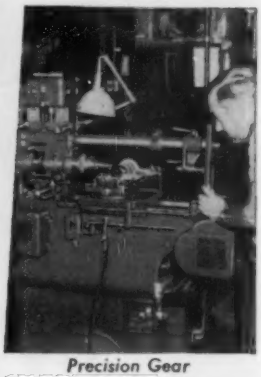


Precision Boring

Precision Welding

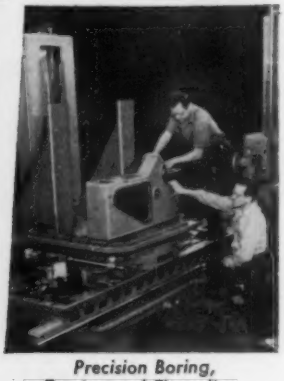


Instrument Plating



Precision Gear Cutting

Hobbing 56" Ring Gear



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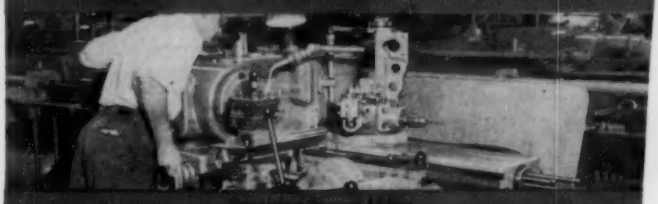

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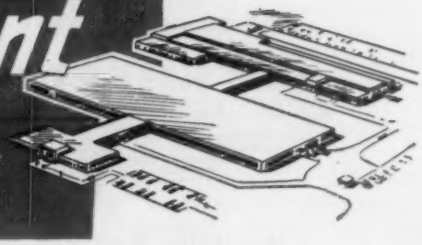

out in HIAD (Handbook of Instruction for Aircraft Designers), according to company spokesmen. Actual values vary with size and material.

• **Tensile strength** of the inserts meet or exceed spec requirements in both structural and non-structural uses.

• **Prevailing torque** (in-motion torque which prevails after break-away torque) meets or exceeds spec requirements.

• **Vibration tests,** conducted on WADC-approved vibration machine, showed that the screw-lock insert meets all specification requirements.

▶ **Three Sizes Approved**—Heli-Coil screw-lock inserts are precision-formed coils, usually but not always made of 18-8 stainless steel wire having an ultimate tensile strength of approximately 200,000 psi.

Wright Field has approved their use in these sizes: 6-32, 10-32, ¼-28. Three other sizes, 8-32, 10-24, ¼-20, have been approved thus far for special applications.

Paul E. Wolfe, director-project engineering, says that not only does the screw-lock insert permit elimination of lock nuts and lock washers, saving weight and space and allowing reduction in screw length, but elimination of lock-wire assemblies in non-critical areas reduces installation time. Also, screw or bolt can be readily removed by applying same "off" torque as used for original assembly, and use of standard instead of drilled-head bolts cuts costs.

▶ **Insert Installation**—Use of the screw-lock insert requires two steps:

The insert is installed in a tapped hole with a prewinder type of inserting tool. The insert is then seated with a tapered, precision-threaded tool, which seats the grip-coil of the insert.

Heli-Coil officials say the insert could have many non-aircraft uses. Among them are holding a set screw in a pulley so it cannot loosen and gripping adjusting knobs so they stay in any desired position in vibrating bodies such as automobiles or engines.

Conveyors Speed Overhaul at NWA

Northwest Orient Airlines has expanded and "conveyorized" its system engine overhaul shop at Holman Airport, St. Paul, to handle four Lockheed 1049G Super Constellations being delivered.

Based on a careful study of overhaul methods used by the country's major airlines, the new system includes an 890-ft. overhead conveyor system, a work conveyor system in the cylinder shop and three traveling-cranes in the sub-assembly area.

Costing $70,000, the "continuous flow" system will speed up engine overhaul, reduce manual operations, ease handling of heavy engine parts and generally improve the shop's overall efficiency, NWA notes.

The shop will handle five types of aircraft engines: Pratt & Whitney R4360s (Boeing Stratocruiser); R2800s (Douglas DC-6B); R2000s (DC-4); R1830 (DC-3); and the Super Connies' Wright Turbo Compound R3350.

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THE GENERAL TIRE Industrial Products Division WABASH INDIANA

Riddle Stretching C-46 Engine Period

Riddle Airlines hopes to raise overhaul time of the P&W R2800-51 M1s powering its C-46s to 1,400-1,500 hr. as a result of accumulating over 17,000 hr. on this engine without a single failure. The carrier currently is putting 1,100 hr. on each engine before change.

During the 17,000-hr. period the only malfunctions experienced were two blower replacements, one changed cylinder and one cam tappet failure. All engines, including the ones that malfunctioned, operated 1,000 hr. between overhauls, Riddle states.

The M1 modification was developed by Air Carrier Engine Service, Miami, Fla. (AW July 5, 1954, p. 64).

Changes include forged aluminum cylinders for improved cooling, larger capacity oil pump and later-type cam and valve mechanism, also modification of the blower section.

F-86D Turbopump Is 3-in-1 Unit

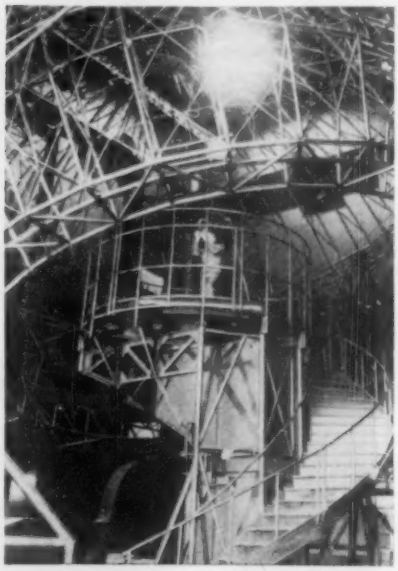
A new air turbine-driven afterburner fuel pump cuts 25 lb. from the weight of F-86D Sabrejets on which it is installed. The pump is in production at General Electric's Lynn, Mass., works.

Called a "turbopump," the unit incorporates three pumps in one and is mounted inside the fighter's fuel tank, eliminating need for separate booster and highspeed pumps and much

Big Mod Job

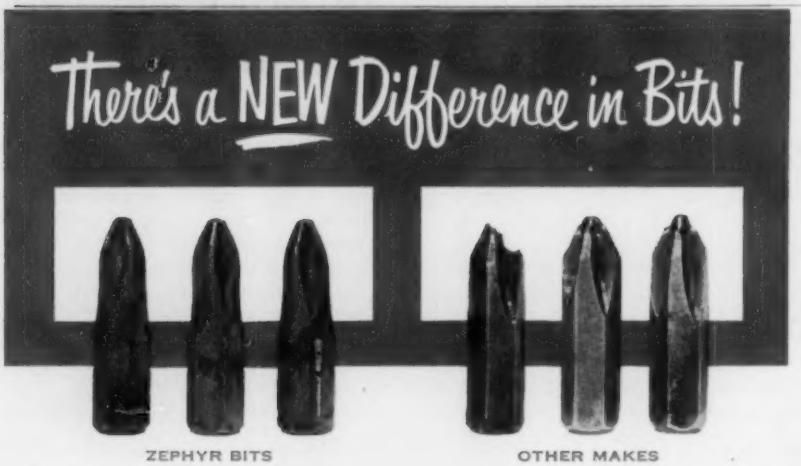
Possibly the most extensive modification of a commercial airliner ever undertaken is now taking place at Lockheed Aircraft Service International's new hangars at New York International Airport.

The service agency is completely modifying a number of Boeing Stratocruisers recently purchased by British Overseas Airways Corp. from United Air Lines. The "from-the-skin-out" changes include such major operations as installing flight engineer's and navigator's stations, autopilot installation, complete passenger cabin rebuilding from insulation to interior fabrics, baggage racks and convertible seating arrangements, new propellers and complete paint job. Six aircraft are involved. Another three of BOAC's Stratocruisers are undergoing less-extensive modifications.



Navigation Trainer

Polar navigation at simulated speeds of 1,750 mph. and altitudes of 100,000 ft. can be undertaken in this new Link D-2 trainer installed at Mather AFB, Calif. The huge device is composed of a 22-ton spherical structure set on two axes. More than 500 tiny, accurately positioned lights duplicate the major stars of 31 constellations over the Northern Hemisphere above 25-deg. North Latitude. It was developed under USAF contract by Link Aviation, Inc., Binghamton, N. Y.



LOOK AT THESE UNRETOUCHED PHOTOGRAPHS—Zephyr's Bits look good as new. The others are spent.

Both underwent the same rough test—driving No. 2, round head Phillips screws into undersize holes of .072 gauge body steel at 750 RPM, under 60-inch-pound torque load.

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heavy piping and wiring, according to GE.

The 86-gpm. pump is driven by bleed air from the plane's J47-33 jet engine. The pump's built-in vapor separator permits the unit to meet the fuel flow requirements for the F-86D's high rate of climb.

OFF THE LINE

AC Spark Plug has appointed five new distributors with extensive territorial coverage as part of an expanded aircraft parts program. The distributors will carry AC's complete line of aircraft spark plugs, as well as some AC aviation instruments. The distributors: Pacific Airmotive Corp., Burbank, Calif.; Southwest Airmotive Corp., Dallas; Airwork Corp., Millville, N. J.; Van Dusen Aircraft Supplies, Inc., Minneapolis; and Standard Aero Engine Ltd., Winnipeg, Canada.

Lockheed Aircraft Service-International, N. Y. International Airport, Jamaica, delivered 1,700 military and commercial aircraft in 1954 following overhauls and modifications, an increase of 735 planes over 1953. Most planes handled were DC-4s, with DC-6s and Super Connies following. LASI employs 1,200.

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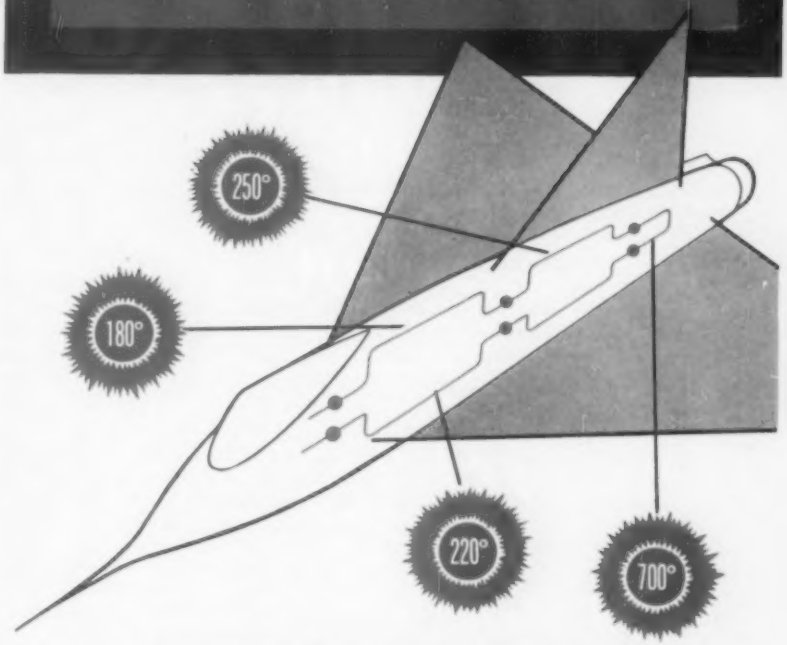

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Tubeless Tire Passes Impact Tests

Development of a high-pressure tubeless airplane tire capable of absorbing the severe shock of landings or takeoffs at 300 mph. has been announced by B. F. Goodrich's Tire & Equipment Div. Goodrich says this tire is the first of its type.

According to Tire and Equipment Div. president Arthur Kelly, the new tire recently passed impact tests of 10,000 lb. at 300 mph., although it is no larger than a passenger car tire.

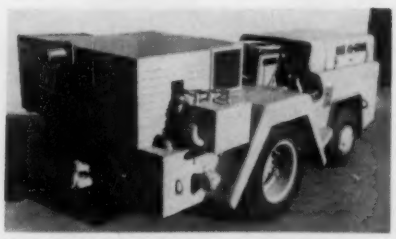
One of its main features is a special tread capable of withstanding the extremely high temperatures and stresses developed by high speeds and heavy loads.

The dyanamometer used to test the new tire employs an electromagnetic clutch between the electric motor and the road wheel that controls the speed to any predetermined deceleration rate, and loads can be controlled while the wheel is in operation. In the dyanamometer landing tests (the new tire has not yet been tried out in an actual landing) the new tubeless tire was rammed against the wheel, spinning at 300 mph. The tire was held against the wheel for a length of time equivalent to the distance an aircraft would travel on the runway when making a landing.

Kelly says the new tire saves up to 40% of tube weight. Basic construction principles are similar to those patented and used in B. F. Goodrich tubeless tires for passenger cars. A layer of special rubber inside the tire seals in the air replacing an inner tube. Ridges moulded on the outer side of the tire bead prevent loss of air around the rim flange.

Absence of the inner tube permits closer control of tire balance and resultant minimizing of highspeed spin-up vibration. Danger of a pinched tube is also eliminated. In addition, the layer of special rubber inside the tubeless tire enables it to retain air much longer than the conventional tube for airplane tires, Goodrich says.

B. F. Goodrich, Tire & Equipment Div., Akron, Ohio.



STARTING PACKAGE has passed Navy acceptance tests. Two versions are available.

Jet Starter Package Fits on Tow Tractor

A jet aircraft starting package installation that fits on the rear of a tractor has recently completed U. S. Navy Bu-Aer acceptance tests, the manufacturer reports.

Originally designed for use on aircraft carriers, the unit is 21 in. high, 45 in. long and 26 in. wide over the metal housing. Weight is approximately 400 lb. It comprises an AiResearch gas turbine compressor which delivers 185 hp. of compressed air for starting jet engines, an aircraft-type battery, starting relay, reduced-speed air valve, auxiliary fuel-booster pump and a 4-gal. external oil tank.

The control layout permits the vehicle driver to operate all turbine functions, or they may be handled remotely by the pilot in the airplane cockpit.

The tractor comes equipped with two 10-ft. lengths of 3-in. hose having external nitrile rings to resist abrasion. An external power supply receptacle is fitted so that the tractor can supply electrical power and starting air to the plane while towing it. Each tractor carries an auxiliary jet-fuel tank of at least 30 gas.

Model TCD-65 tractor with the turbine mounted is 46-in. high overall; the four-wheel-drive Model TUD-80, 60 in. high, is designed for use at airports and advanced bases and can operate under DC-6 or DC-7-type aircraft.

Frank G. Hough Co., Libertyville, Ill.

Night Recording Camera Handles Missile Tests

Tracing of missile trajectories is the job of a special night recording camera developed under U. S. Air Force contract for Redstone Arsenal Ordnance Station.

Designated 22-GE, the cameras use 9-in. x 9-in. film. Lens is a Kodak Aero-Ektar f.2.5 of 12-in. focal length. The focal plane shutter will handle time exposures. An intervalometer will provide remote, sequence operation.

Gordon Enterprises, No. Hollywood, Calif.

UNITS come in 12, 26 and 110-v. models.

Portable Power Generator Weighs Only 30 Lb.

First of a complete line of portable electric power generators designed for ground use around airports and suitable for lighting, operating electric motors, heaters, air conditioners and supplying power for radios, has been developed by LearCal Div. of Lear, Inc. Weight is 30 lb.

Model 5900-B supplies 26-v. d.c. at 50 amp. continuously. Fuel consumption is under 0.5 gal./hr. The engine has an automatic rewind starter and a muffler.

The auxiliary generator comes equipped with a carrying handle. Suction-cup feet aid in damping vibration, also keep the unit from shifting around when operating or stowed. Other models range from 12-v. to 110-v. systems.

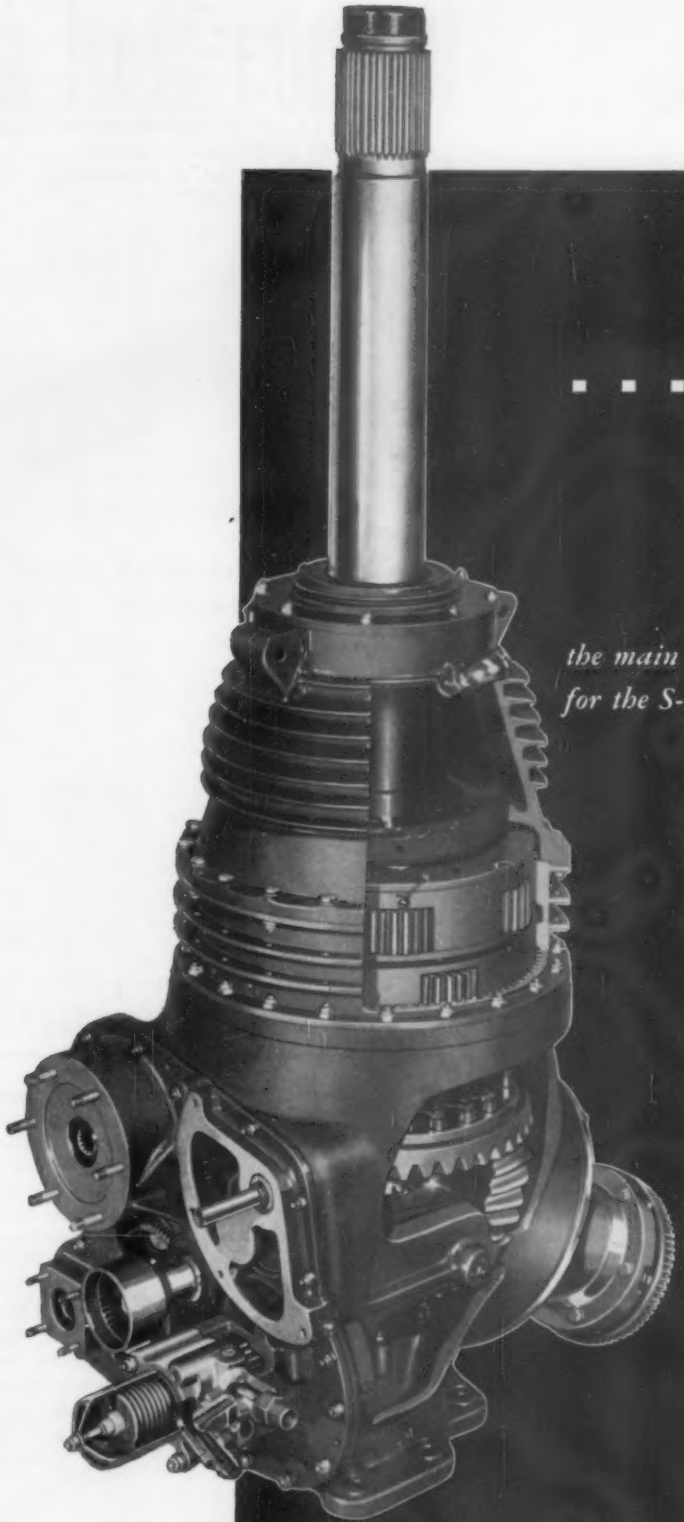
Lear-Cal, 3171 South Bundy Drive, Santa Monica, Calif.

Panagra DC-7s to Get Mated Berthing Chairs

Berthing arrangements will be simplified on Pan American-Grace Airways' new fleet of Douglas DC-7s by use of a new line of seats that eliminate the need for two types of berthing chairs to make up a double berth.

The seat maker has designed Airfoam mattresses that are contoured on the bottom to mate with the seat contours and back cushioning of the berthed units. Full berthing chairs are stated to have all of the comfort and styling of reclining lounge seats. This makes it unnecessary to have auxiliary and full berthing doubles to form one double, it is pointed out.

Full berthing chairs are designated Model 3044 series; dayplane deep-recline lounge chairs are Model 3019DA



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the main rotor transmission for the S-55 Sikorsky Helicopter.

High on the list of "things we are proud of" at IGW is the transmission shown here (demonstration cut-a-way). Precision built to transmit 700 H. P. with an input speed of 2400 RPM and a reduction ratio of 11.348 to 1. In spite of high stresses and great complexity the service life of this transmission has been outstanding.

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series. Chairs are now available for interchange with all Douglas berthable seats in DC-6, DC-6B and DC-7 transports and are also on hand for track-mounting on Douglas, Lockheed or Brown-Line-type track in these Douglas and all Lockheed Constellation planes.

Hardman Tool & Engineering Co., Los Angeles, Calif.

RUSTPROOF clamp holds plastic conduit.

Hand-Tightening Enough For Plane-Conduit Clamp

A new clamp for holding flexible plastic-tube wire conduits in place on aircraft can be tightened by hand, eliminating use of tools and saving many man-hours during servicing, the maker states.

Device is machined from aluminum and has an anodized rustproof finish. When used in connection with a gasketed adapter, a waterproof joint is provided between the connector and the plastic conduit.

H. H. Buggie, Inc., Toledo, Ohio.

ALSO ON THE MARKET

Automatic gear grinder, costing about $27,000 with all accessories, is offered to small shops. Special tooling designed into the grinder is said to eliminate need for large inventories of costly special tools. Complete setup can be made in one-hour, the maker claims.–Belock Instrument Corp., College Point, N. Y.

Fluid Power, Inc. of Macedonia, Ohio, manufacturers of aircraft oxygen regulators and related equipment and test devices, has appointed Aircraft Industrial Marine Sales Co. as Gulf Coast representative. Aircraft Industrial's address: Van Antwerp Building, Mobile, Ala.

Portable arc welder has voltage characteristics making it particularly useful for inexperienced welders or mechanics. Rating is 15-180 amp., permitting welds of ½-in. steel. Unit may also be used as a carbon torch for heating, soldering, brazing and welding of brass and aluminum.–Illumi Tronic Engineering Co., Sunnyvale, Calif.

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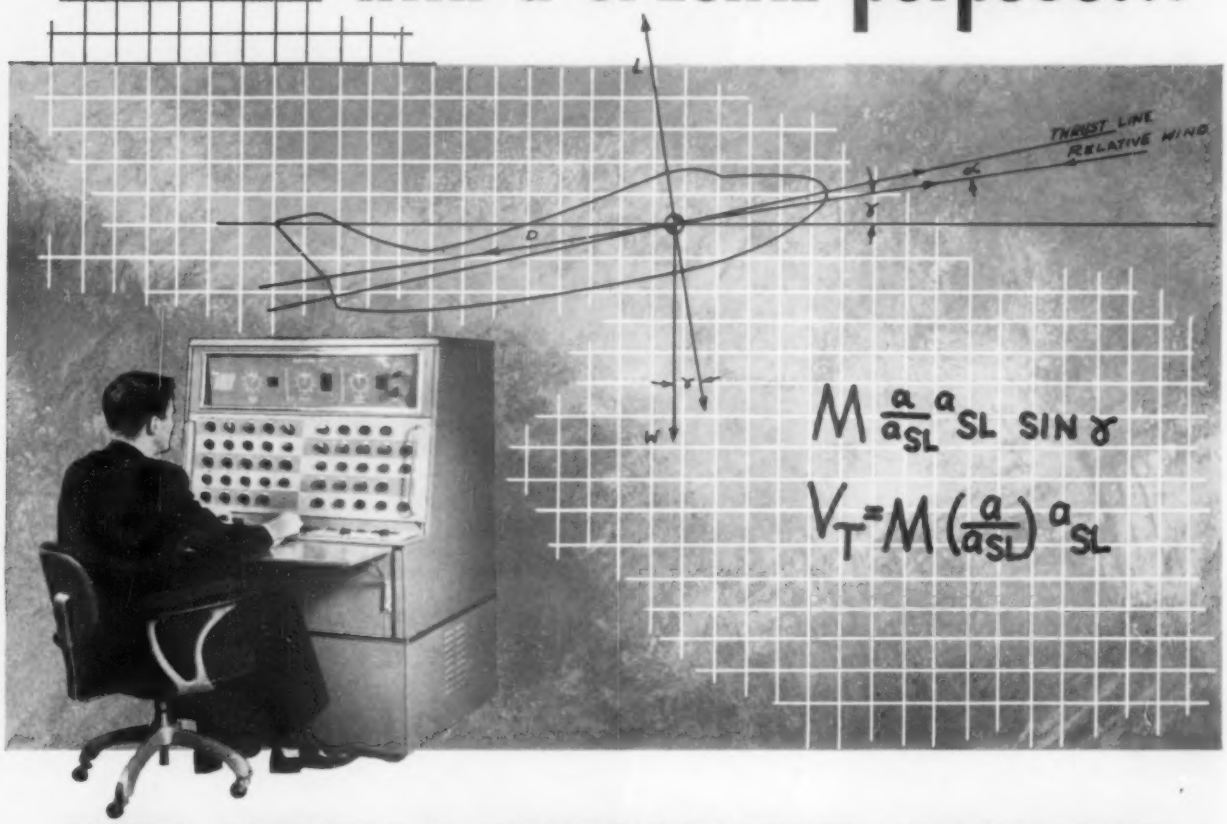

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Backed by more than a quarter century of experience—gained from the designing and building of Flight Simulators and Trainers which duplicate actual flight conditions—Link Aviation, Inc. now introduces its newest development, the Aerolog Performance Computer.

This special purpose computer instantly solves the classical airplane performance equations. Computation is continuous during the introduction of input variables.

The Link Aerolog Performance Computer eliminates the time-consuming solution of performance equations by tabulating machine or general purpose computer methods. Now—at the finger tips of the aerodynamicist—is a computer designed for his own personal operation.

Rigorous equations of motion are solved without climb angle restrictions. Secondary corrections to rate of climb due to flight path curvature and momentum changes are introduced and computed with unequalled accuracy.

And these are but a few of the advantages of the new Link Aerolog Performance Computer. We would be pleased to furnish complete data at your request.

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Western Europe's Answer To The 'Knock Out' Attack

If—and when—war breaks out again the only warning we can count on is a radar signal flash.

One thing is certain. The days of thousand-bomber raids and official declarations of war are over for good. Security now lies in efficient systems of aircraft detection and the speed and fire-power of fighters that can fly in all weathers.

This is what makes the Gloster Javelin so important. It solves a critical operational need. The improved radar, fire power and extraordinary high rate of climb of this versatile aircraft puts new teeth into Europe's first line of defence against sneak raids.

No other all-weather day and night fighter packs such a big punch as the Javelin. And because of its highly sensitive integrated radar system, no other fighter is as quick and accurate in getting to the "trouble spot" in time.

Twin Armstrong Siddeley Sapphire engines thrust the Javelin speedily toward its prey. From the first flash of warning the Javelin can be attacking at over 50,000 ft. in a very few minutes. Refueling and reloading are also a matter of minutes.

It is true to say that no other all-weather fighter made anywhere has such range, speed or destructive firepower. In fact, the Javelin has already altered the pattern of defence in Western Europe's favour. This key aircraft was designed and developed by Gloster, makers of the world's first successful jet aircraft and one of the remarkable Hawker Siddeley Group of companies.

THE WEATHER

Widespread fog

Vigorous troughs of low pressure will move E. across the British Isles. It will be dry in some E. [illegible] fog affect[illegible] Isles [illegible]

follow the fog across during the afternoo many N. areas of Temperatures will normal. Winds wi and reach gale for

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DAY AND NIGHT ALL WEATHER FIGHTER

Gloster Javelin

GLOSTER AIRCRAFT CO. LIMITED, GLOUCESTER, ENGLAND. *Member of the Hawker Siddeley Group. Pioneer ... and World Leader in Aviation*

Insured Manpower

Low re-enlistment rate, according to military spokesmen, is one of the most serious problems in connection with maintaining the desired level of strength of the armed forces. For numerous reasons skilled military men are simply dropping out of uniform, especially when their first "hitch" is up.

No less an authority than Air Force Secretary Harold E. Talbott recently stated, "Currently we are losing more than $2 billion a year in trained airmen." As one observer has put it: "If the Air Force were losing the same amount in airplanes each year, there would be a helluva stink raised."

▶ **$2 Million per Crew**—This high figure is not hard to arrive at when it is considered that it takes well over half a million dollars to train one B-47 pilot, or nearly $2 million per three-man crew. And the experience that five years of training produces is an asset not easy to put a price on, but obviously is an important part of national strength.

Without attempting to delve into the many causes of this state of affairs, nor to provide a ready answer to serve all cases, the following idea is offered for what it is worth. It is designed primarily for pilots but may find use for other personnel.

Pilots in the Air Force, as do many other specialists, receive extra "hazard" pay—in this case, "flight pay." While it is by no means the only enticement for the job, it nevertheless constitutes a sizable portion of a man's income, and its importance should not be minimized.

▶ **In the Same Boat**—Receipt of this flying pay obviously is contingent upon the holding of a pliot's license. Therefore a guarantee against loss of license, due to physical disability, might help induce some military pilots to remain in service.

Airline pilots, indeed all professional pilots, are somewhat in the same boat:

Their career is dependent upon one small certificate. Let an eye go sour, a heart murmur leak through or a jillion other things happen and, blooey! there goes the whole works.

Since way back there has been a strong demand from airline pilots for some sort of insurance to take care of this situation. It was not thought of as being a retirement program, nor a lifelong "pay me" proposition, but rather as an income for a few years to allow an individual time to change his method of livelihood and still provide his family with their accustomed meals.

▶ **Pilot Insurance**—Through efforts of the Air Line Pilots Assn. this "loss of license" insurance was brought into being about a year ago. For the usual small annual premium, members receive up to $500 a month for approximately three years if any physical disability precludes their holding a pilot's license.

Without a doubt this plan was received by ALPA members as being one of the most important pieces of security they could obtain. There is no reason to suspect that Air Force pilots would not also gain from a similar scheme. And with more participants, it is possible that greater benefits might result.

Fortunately, the Air Force, and other services as well, have recognized the need for keeping skilled people and are making an attempt to ease some of the problems.

Many of these items are difficult to solve since military life is inherently somewhat different than civilian. It is hoped in all quarters that substantial headway will be made. Skilled manpower is the most important natural resource of our country, and all steps should be taken to insure the nation against its loss.

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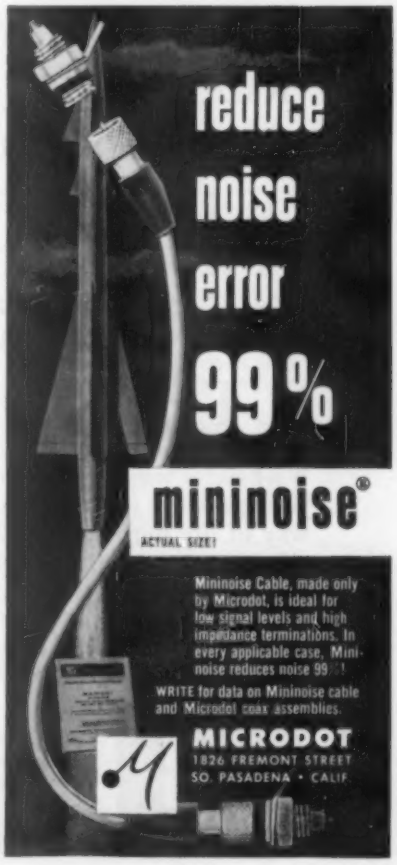
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AVIATION CALENDAR

Apr. 13-15—American Society of Lubrication Engineers, 10th annual meeting, Hotel Sherman, Chicago.

Apr. 14-15—American Ordnance Assn., symposium of Proving Ground Instrumentation Committee, Patrick AFB, Fla.

Apr. 14-16—International Airline Navigators Council, fifth convention, San Francisco.

Apr. 16-20—American Association of AirportExecutives, 1955 annual convention and business meeting, El Conquistador Hotel, Tucson, Ariz.

Apr. 18-21—Society of Automotive Engineers, Golden Anniversary Aeronautic Meeting, Aeronautic Production Forum and Aircraft Engineering Display, Hotel Statler and McAlpin Hotel, New York.

Apr. 18-21—American Society of Mechanical Engineers, Diamond Jubilee spring meeting, including four aviation sessions, Lord Baltimore Hotel, Baltimore.

Apr. 20-22—American Rocket Society, spring meeting, Baltimore.

Apr. 24-28—Airport Operators Council, eighth annual meeting, eattle.

Apr. 27-29—Society for Experimental Stress Analysis, spring meeting, Hotel Statler, Los Angeles.

Apr. 27-30—American Helicopter Society, 11th annual forum, Hotel Mayflower, Washington, D. C.

Apr. 28-29—Michigan Aeronautical Conference, University of Michigan, Ann Arbor.

Apr. 29—Institute of Norwegian, eastern regional meeting, Friendship Airport, Baltimore.

Apr. 29-30—New England radio-electronics meeting, sponsored by Boston and Connecticut Valley sections of IRE, Sheraton Plaza Hotel, Boston.

Apr. 30—Air Force Assn., Illinois Wing's annual convention, Sheraton Hotel, Chicago.

May 2-5—Society of Aeronautical Weight Engineers, national conference, Hilton Hotel, Ft. Worth.

May 3-5—Instrument Society of America, first national Flight Test Instrumentation Symposium, Allis Hotel, Wichita.

May 4-6—Fourth International Aviation Trade Show, 69th Regiment Armory, New York.

May 5—First International Aircraft Mart Exposition, Will Rogers Memorial Coliseum, Ft. Worth.

May 5-8—National Inter-Collegiate Flying Assn., annual convention and air meet, Meacham Field, Ft. Worth.

May 7-8—Association of Northeastern College Flying Clubs, annual inter-collegiate air meet, Troy (N. Y.) Municipal Airport.

May 9-11—National Conference on Aeronautical Electronics, Biltmore Hotel, Dayton.

May 16-20—National Materials Handling Exposition, produced by Clapp & Poliak, International Amphitheatre, Chicago.

May 23-24—American Society for Quality Control, ninth annual convention, Hotels Statler and New Yorker, New York.

May 30—Federation Aeronautique Internationale and KNVvL Royal Netherlands Aeroclub, fifth International Air Display, Ypenburg Aerodrome, The Hague.

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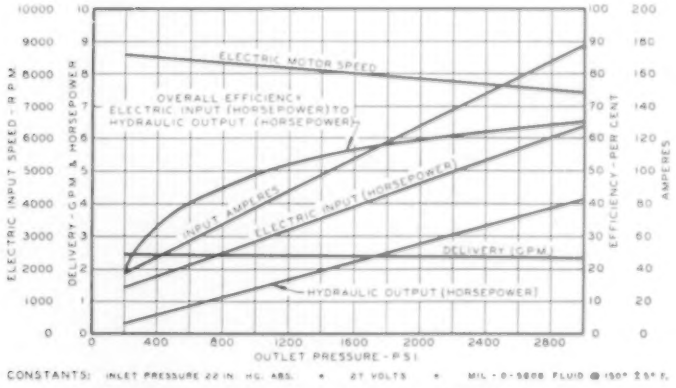
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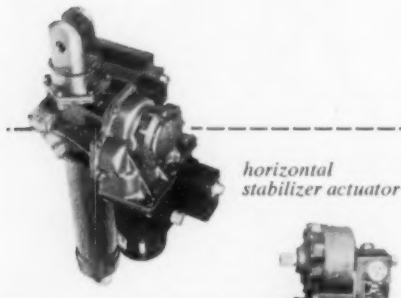

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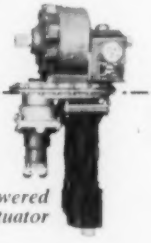

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American Renews Airfreight Campaign

By Gordon Conley

American Airlines believes the air transport industry is bungling its chances to build airfreight into a major profit earner. To straighten out its own operation, AA is trying to change airfreight from an emergency service to a routine shipping method.

The new campaign still sells speed as the primary advantage. But American is showing shippers how they can cut expenses by using this fast delivery service on a day-to-day basis.

By planning regular airfreight shipments, the airline says, shippers can lower their inventories, reduce warehousing, cut enroute losses, simplify handling methods and, in many cases, open new areas of business.

▶ **Statistical Approach**—The concept of major economies through fast deliveries is not new. Since the start of airfreight, carriers have tried to sell shippers on the idea that speed would more than make up the difference between surface and air rates.

"But air transportation made no attempt to back up this conception" says Thomas J. Harris, American's manager of cargo sales. "No one came up with facts and figures that could be applied to individual companies to prove big savings were possible."

As the first scheduled airline to start lifting freight in 1944, American had a hand in selling the service short. Now AA is putting approximately $200,000 into a program designed to give shippers statistical proof of airfreight's economy.

▶ **Airfreight Savings**—The air carrier is tackling one company at a time. If shippers agree to an analysis of their individual operations, American believes it can show how savings are possible through:

• **Greater speed.** In most companies, faster shipments would let them do business with less goods on hand. This would reduce warehousing costs, cut handling expenses and lower the number of items that become obsolete in storage.

Speed also would allow manufacturers to give the same fast service they provide in their immediate regions to customers in distant cities, opening the way to new markets.

• **Better protection.** In air transport, American says, there is less chance of pilferage, theft and accidental loss. Enroute damage also is considerably lower.

• **Simpler methods.** Administrative costs can be reduced, because tariff rules, routes and rates, tracing, auditing and classification requirements for airfreight are easier to apply.

AMERICAN DC-6A unloads freight at LaGuardia less than 14 hr. after leaving West Coast.

With facts and figures to back up these arguments, American believes its greatest area of expansion for the immediate future is in the top commodities now handled by airfreight—but usually on an emergency basis.

These leading commodities are: auto accessories and parts; wearing apparel; machines; cut flowers; electrical equipment; aircraft accessories and parts; biologicals; medicines and drugs; printed matter; metal bars, castings, ingots or sheets; cloth and fabric; advertising displays; newspapers; radios and phonographs; hardware; electronic equipment; paper and related products; dry goods; aircraft and automobile engines.

▶ **Increased Demands**—In operations, American is trying to improve airfreight services to meet new demands.

"The character of shippers is changing," says J. M. Glod, director of cargo services. "They are more demanding. They aren't satisfied with the services of a year ago. Where a shipper used to allow for a 24-hour delay, he now plans immediate use of shipments.

"This is an industry problem. If we are to retain the shipper's confidence, we've got to deliver on schedule."

To meet the stricter requirements, American is concentrating this year on dependability of deliveries, condition of cargo and accurate information on schedule capabilities.

▶ **Combination Advantage**—Operations personnel believe they have a better chance of satisfying these customer demands than either surface carriers or all-freight airlines. "We have a tremendous advantage over all-cargo lines," they say. "We have a big passenger fleet to back up our freighters."

Normally, AA plans on moving 60% of its freight on combination passenger-cargo transports. The freighter fleet will increase its percentage when American takes delivery in 1956-57 of four Douglas DC-6As now on order, giving the airline seven of the all-cargo aircraft.

American's DC-6As carry an average of 31,000 lb. of cargo—32,500 lb. on short-range flights and 28,500 on long-range. This compares with 20,000 lb. on freighter DC-4s and with 8,500 lb. on DC-6Bs, 6,200 lb. on DC-7s, 5,500

New Freighter

New all-cargo turboprop transports capable of lifting 100,000-lb. payloads are on the boards of at least two aircraft builders. Production models are expected to be available after 1956.

"With one of these transports," says an American Airlines spokesman, "we could carry freight at half the existing (ton-mile) rates of 21-22 cents."

But industry observers predict the transports' costs will be exceedingly high, even if the government pays for research and development price tag forecast for the new freighters: more than $4 million each.

lb. on DC-6s and 2,500 lb. on Convair 240s in the freight-passenger service.

"On DC-6A flights," operations experts say, "we seldom run out of space."

▶ **Profit Earner**—AA has only one complaint about the new Douglas freighter: "Its operational cost doesn't permit lower rates, and we've got to reduce them to get airfreight volume equal to the passenger operation."

But the DC-6A is the first of its type to show a profit. American's all-cargo DC-4s do not make money except with a load factor of at least 90%.

Senate Committee Praises Copter Services in Feeder Airline Report

Senate's Interstate and Foreign Commerce Committee strongly encouraged the bid of the three helicopter services—in New York, Chicago, and Los Angeles—for permanent certification.

In approving legislation directing permanent certificates for the 14 existing local service airlines, the Senate committee expressed its "great admiration for the pioneering efforts of the three certificated metropolitan helicopter carriers." Its report to the Senate added:

"Helicopter carriers unlike the local service carriers are in an experimental route structure state. The most experienced ones have only recently received approval and begun passenger service with single-engine machines. Thus they have only commenced to show their commercial passenger-carrying capabilities.

▶ **Certification Criteria**—"When helicopter carriers have developed a suitable background of revenue passenger miles, and a proportion of commercial revenues to mail revenues comparable to the present industry average of the local service carriers, they may well be considered for permanent certification. Until that time, the committee will watch the development of the helicopter carriers with interest and enthusiasm," the report stated.

Under similar bills voted by both Senate and House Commerce Committees—one of which will be approved by both houses—the Civil Aeronautics Board would have to give the 14 local lines permanent certificates within 120 days after enactment unless it can be shown that service since the last certification has been "inadequate and inefficient."

The committees formally dismissed CAB's argument that permanent certification would "freeze" local route patterns and preclude improvement. They pointed to the provision of the 1938 CAA Act giving the Board authority to "alter, amend, modify or suspend, in whole or in part, any certificate."

The Senate bill also would authorize CAB to exempt from permanent certification up to one half of the intermediate points of a carrier's route system.

▶ **Feeder Picture**—The local airlines now have a total route mileage of 30,000, serving 444 cities—264 of them exclusively—with a total population of 47 million. They operate 161 aircraft and employ 439 flight crews and approximately 1,000 mechanics. There are only six states not served by a local service carrier: Connecticut, Maine, Rhode Island, Vermont, South Dakota, Nebraska.

Certificate Benefits

The Senate committee anticipated that these benefits will follow from permanent certification:

• "The recurrent and extensive diversion of executive talent to certificate renewal proceedings will be ended so that executive talent can be devoted to improving the operations of the airlines themselves and thereby better serving the public interest and generating more commercial revenues.

• "The expense saddled upon the carriers by recertification proceedings, estimated upward to $100,000 for each renewal, will be terminated and that money can be devoted to advertising, to such capital improvements as maintenance and navigational aids. . .

• "The great expense and inconvenience to states and cities and other users of the feeder service who must devote great effort to supporting applications for renewal will be ended. Likewise the great expense to the Federal government of having the Civil Aeronautics Board conduct such proceedings will be terminated and we may anticipate a consequent reduction in the administrative expense of the Board.

• "States and municipalities which have invested money in aeronautical facilities will have some assurance that their investments in those facilities may be considered foresighted rather than speculative.

• "The promotion of American commerce and national unity will be furthered by strengthening and making permanent the system of local air carriers which flew nearly 2½ million Americans to, from, and between the small and intermediate-size cities last year.

• "The local carriers may develop long-range personnel programs and offer long-range careers to employees. In the past all contracts of employment with local service carriers have been short-range and have led to a personnel turnover rate twice that of the trunk carriers and a consequent high training and replacement expense.

• "The local carriers may, after passage of this legislation, make long-term arrangements for hangars, navigational equipment, maintenance, and other facilities with the consequent economies to themselves and the government that are inevitable from such arrangements.

• "Users of the services of the local airlines will be able to plan new plants and expansions of, or additions to, old plants with some confidence that the air service on which they depend is permanent.

New Aircraft

• "Aircraft manufacturers may be convinced that they should design and build an aircraft tailored to the requirements of the local service airlines. Up to now the local carriers have been forced to rely almost exclusively on the DC-3-type aircraft. While this is a good and well-proved airplane, it has ceased to be an economical or efficient one for any commercial operation. At the present time no other American aircraft is in sight for the feeders except such hand-me-downs from the trunk airlines as Convairs or Martins.

"These, like the DC-3, are good airplanes for the mission for which they were designed, but once again their utility to the feeder airlines is, to be most optimistic, problematical. Hitherto manufacturers have been most reluctant to undertake a new design of a true local-service-type aircraft because of their doubt that there would be any customer for such an aircraft by the time it was designed and ready to fly. Passage of this bill will assure manufacturers that local airline service is here to stay.

U.K. Backlog

Backlog of orders for large British transports now numbers 214. The total was pushed over 200 with British Overseas Airways Corp.'s order for 20 of de Havilland Aircraft Co.'s new Comet 4s and one modified Mark 2 (AW Mar. 28, p. 85).

The backlog also includes orders at:

• Vickers-Armstrongs, Ltd., for 128 turboprop-powered Viscounts. Forty-nine of the medium-range transports have been delivered.

• Bristol Aeroplane Co. for 36 long-range turboprop Britannias. Options have been taken on an additional six.

• Handley Page, Ltd., for 29 piston-engine Heralds.

• "The local service airlines will be able to establish sensible financing programs on a long-range basis. Such disadvantages as premium interest rates on loans, loan periods timed to temporary certificate dates, personal guaranties on corporate airline loans, and many other penalties which the uncertain nature of the feeders' prospects have visited upon them may be either reduced or avoided."

Board Asks Airline Reaction to Crash Axe

Civil Aeronautics Board has asked industry comment on a further proposal requiring crash axes on scheduled airline transports and marks for fuselage cuts in the event of an accident.

The Board's original proposal was to take effect Apr. 1, but immediate compliance has now been deferred until May 1 pending response from the airline industry.

Major objection of the industry was the suggested requirement for a second crash axe when more than 30 passengers are carried.

CAB readily acknowledged that further study revealed no necessity for a second crash axe. The Board also eliminated the requirement for chop marks on the outside of the aircraft fuselage.

CAB's proposal now, if adopted, would amend CAR Part 40 to read: "All airplanes shall be equipped with at least one crash axe and all emergency exits shall be clearly marked as such from the outside."

Transportation Policy Draft Favors Railways, Release Unlikely

The Administration's long-pending transportation policy report probably will not be released publicly because of its politically explosive nature.

President Eisenhower ordered the Cabinet level study to be made last year. Commerce Secretary Sinclair Weeks is chairman and serving with him is Defense Secretary Charles E. Wilson and Defense Mobilization Director Arthur Flemming.

A summary of an early draft, obtained by the Wall Street Journal, indicates a collection of recommendations heavily weighted in favor of the railroads. The draft treats the airlines directly in a general way.

▶ **Subsidy Policy**—A basic concern is with subsidy. The report advocates limiting subsidies to a temporary status —a line the Civil Aeronautics Board and the airlines have been taking for years. But apparently legislation which could stem from such recommendations might make the terms of withdrawal more specific. Such a move could take the flexibility out of the subsidy program and make budgetary issues rather than development of air transportation the basic factor in it.

The report deals more specifically with the railroad industry, and the recommendations of the Administration are of concern to other transportation industries since they could outline the form rail competition could take.

A basic concern of the report is with rates. The Interstate Commerce Commission, which controls railroad rates, would have its powers trimmed drastically. It is recommended that the ICC's power to put ceilings on rates be abolished, but that it retain the power to set minimums. Time intervals used by the ICC in changing rates would also be cut. Other rates rules are advocated which would favor the railroads over other forms of transportation.

Repeal of governmental advantages in bargaining for rates among carriers is recommended.

▶ **Restraint Factor**—Another important item is the recommendation that railroads be allowed to engage in the bus and trucking business. This is viewed as a move which could lead to restraint of competition and retard development of subsidiary forms of transport in favor of parent railroads.

Federal aid for research in railroad problems is advocated as an aid to the industry.

One uncontroversial item is a recommendation that the transportation taxes on freight and passengers be repealed, something all types of carriers have been fighting for years.

▶ **Deadline Missed**—These recommendations have not received the blessings of the White House, nor are they the final recommendation of the committee. The issues involved have proved so hot that the group working on it has been unable so far to produce an acceptable document.

The report is being prepared by a cabinet committee headed by Secretary of Commerce Sinclair Weeks. It was started nearly a year ago with the purpose of drawing up a transportation policy for the Administration. It was scheduled to be completed by Dec. 1.

Some of the opposition to the project has come from within the government itself. The Department of Agriculture is unhappy about the effect it would have on farmers, and the Defense Department and General Services Administration do not like being deprived of their ability to get advantageous rates by negotiating among carriers.

▶ **Monopoly View**—Justice Department is reported to be concerned with the monopoly aspects of recommendations that the railroads be allowed to branch out into other transportation industries.

Support of the position of one industry against its fellows is viewed as a foolhardy move by political observers. The Administration isn't expected to

London Opening New Passenger Terminal

T-shaped ramps connect London Airport's new central terminal and loading docks. Buildings opening Apr. 17 will be occupied by British European Airways and 10 continental airlines who together handle 75% of arriving and departing passengers. Control tower is at upper right. Offices, briefing, customs, meteorology and public facilities will be located in unfinished building at left. Air terminal facilities will cost an estimated $100 million.

Civil Airframe Shipments Decline

Civilian aircraft shipments in January amounted to 857,700 lb. in airframe weight, Department of Commerce reports. This compared with shipments of 882,300 lb. for the same month in 1954. The breakdown:

	January 1955	December 1954	January 1954
Complete aircraft	350	290	278
By weight of airframe			
Less than 3,000 lb.	328	272	254
3,000 lb. and more	22	18	24
By number of places			
1 to 5 place	322	265	253
More than 5 places	28	25	25
By total hp., all engines			
Up to 339 hp.	317	263	253
400 hp. and more	33	27	25
Total value of completed parts (000 omitted)	$28,783	$18,335	$30,490
Aircraft	23,337	12,794	24,302
Less than 3,000 lb.	3,914	3,270	2,890
3,000 lb. and more	19,423	9,524	21,412
Aircraft parts	5,446	5,541	6,188
Total aircraft engines and parts (000 omitted)	$12,392	$13,505	$11,405
Aircraft engines	5,996	6,336	4,840
Engine parts	6,396	7,169	6,565

publish a report which would antagonize either the trucking industry or the airlines, both are politically potent.

The final form which the efforts of the committee will take is uncertain. There is a good chance that no document will be produced, but that the findings of the committee will come in the form of legislative recommendations. Most observers agree that any proposed legislation would have to be considerably milder than currently pictured in order to have a chance of getting through Congress.

New Orleans-Mexico Route Near Decision

Validity of Eastern Air Line's certificate for a New Orleans-Mexico City route, in dispute since former President Truman withdrew the authorization in 1952, appears near settlement.

Civil Aeronautics Board injected the issue in the New York-Mexico City nonstop case. Eastern won its point over the objections of the other two applicants in the proceeding—American Airlines and Pan American World Airways.

► **Similar Issues**—The board directed CAB examiner Edward T. Stodola to accept briefs from the interested parties, as well as Braniff Airways and Western Air Lines on the sole issue of the validity of the certificate of Eastern for a New Orleans-Mexico City route. Braniff and Western were included on the basis that similar legal issues exist with respect to certificates for Mexico City issued to them.

Eastern lost a second round with the Board in a concurrent action rejecting an appeal from the examiner's denial of compulsory attendance of certain witnesses and producing certain documents in the nonstop case. Eastern unsuccessfully sought to have the whole history of U. S.-Mexico air route relations since 1946 produced for the record. CAB contended the request was unreasonable in scope and limited in materiality.

► **Ultimate Decision**—Despite the Board's opening the record in the nonstop case to allow consideration of the validity of Eastern's certificate to serve Mexico, CAB did not assure a decision on the issue. Any ultimate decision would have to be made by the President.

CAB said it would pass on the validity of Eastern's New Orleans-Mexico City certificate only if it becomes necessary in transmitting its recommendation to the President in the nonstop case.

IATA Cuts Air Cargo Rates Across Atlantic

Lower rates on some air cargo shipments between North America and Europe will become effective July 1 under a new rate system adopted by scheduled carriers on North and Middle Atlantic routes.

The new rating system, International Air Transport Assn. said, will reduce the several thousand existing special rates for specific types of cargo to less than 50 broad classifications.

► **20% Reduction**—Basic general cargo rates remain unchanged, but their application to specific types of cargo will be revised, IATA said. The agreement is subject to approval of IATA Traffic Conferences and interested governments.

Pan American World Airways predicted that the new rate structure would provide a 20% reduction in rates for commodities representative of 75% of the North Atlantic business.

Willis G. Lipscomb, PAA's vice president for traffic and sales, forecast an increase of at least 50% in the trans-Atlantic air cargo business, on the basis of the new rates. Present air cargo business which totaled 20 million lb. for 12 airlines in 1954, is expected to total 30 million lb. in the first full year of operation under the new rates, Lipscomb said.

John Brancker, IATA traffic director, said: "The essential aim is to make cargo selling simpler, cargo service more attractive, and cargo rates cheaper . . ."

► **Six-Cent Drop**—Pan Am estimated that the change means a drop from an average of 32 cents a ton-mile to 26 cents in the airline's charges.

The present 30% discount for general shipments of 440 lb. or more will be dropped in favor of other bulk discounts within the commodity rating system.

The existing 25% discount for general cargo shipments weighing 100 lb. or more will be retained.

Los Angeles Airport Raises Airline Rent

Los Angeles—Five major airlines holding basic leaves at Los Angeles International Airport have concluded negotiations with the Board of Airport Commissioners on passenger terminal facilities and rates to be paid by the airlines.

The Airport Commission agreed to expand the terminal aprons and fingers so as to provide necessary additional passenger handling facilities.

Immediate consideration will be given to the expansion program, and construction is expected to get under way during the current year, according to the Department of Airports.

The airlines agreed to pay annually an additional $93,264, as recommended in the survey made for the Commission by Aviation Services Co. of Minneapolis, to compensate the city for losses in certain phases of the airport operation and for the use of these new facilities. The agreement will be effective when the new facilities are completed.

Companies include American Airlines, Pan American World Airways, Trans World Airlines, United Air Lines and Western Air Lines.

Braniff Asks Court to Void Merger

Braniff Airways moved last week to block the merger of Continental Air Lines and Pioneer Air Lines by asking for judicial review of the case.

The U. S. Court of Appeals in New Orleans, La., has been asked by Braniff to review the series of Civil Aeronautics Board orders dealing with the merger and to stay the effectiveness of the orders until review is completed.

Braniff had already asked the Board to reconsider its action in approving the merger. The CAB turned the carrier down. When Continental and Pioneer said they would complete their integration action April 1, Braniff initiated proceedings in the federal court to block it.

► **Violation Claimed**—Substantial loss of revenue is seen as a strong possibility by Braniff if the merger goes through. The carrier estimates losses of $254,750 annually through increased competition from Continental when it takes over Pioneer's routes and integrates them with its own.

In asking for a stay of the CAB orders, Braniff says it would be difficult, if not impossible, to "unscramble" the situation if the merger goes through and the court subsequently finds the orders invalid.

The petition for review asks the court to reverse the CAB on the merger. Braniff says the Board didn't treat the case properly in respect to dealing with the company's objections and is in violation of the Administrative Procedure Act. Thus, says Braniff, the orders are invalid.

► **Transfer Questioned**—The carrier also raises a legal question on the Civil Aeronautics Board's power to transfer Pioneer's certificate to Continental. The Pioneer certificate expired Sept. 30, 1954, but the carrier continued to operate under a law which authorizes such operation while the CAB is attempting to reach a final decision on the certificate renewal.

Braniff contends that such temporary operating authority is not transferable, and that the Civil Aeronautics Board doesn't have the power to order the transfer.

CAP Defense Role

Civil Air Patrol will demonstrate its atomic defense role as a participant in the Federal Civil Defense Administration's "Operation Cue," scheduled for mid-April in Nevada.

Forty members of the CAP Nevada Wing have been selected to participate in the FCDA atomic test project to perform air support missions that would be required for civil defense in the event of an actual emergency.

CAP missions will include measuring radiation from the air over the site of a nuclear explosion, aerial ambulance service, courier service and mobile communications support.

CAB ORDERS

GRANTED:

Trans World Airlines a temporary exemption to provide free transportation to technical representatives of Lockheed Aircraft Corp., Wright Aeronautical Corp. and Hamilton Standard Division, UAC, for purposes of in-flight observation on the 1049G Super Constellation, for six months.

Empresa Guatemalteca de Aviacion permission to serve New Orleans through Moisant International Airport.

Mohawk Airlines an extension of its authority to serve Keene, N. H., to Apr. 24, 1955.

APPROVED:

Interlocking relationship between Slick Airways and John R. Alison, a director of Slick and vice president of Northrop Aircraft, Inc.

Agreements between United Air Lines, Bonanza Air Lines and various other carriers relating to intercompany arrangements.

AUTHORIZED:

Okanagan Helicopter Ltd. to conduct pipe-line patrol flights between Sumas, British Columbia, and Ferndale, Wash., until Mar. 31, 1956.

AMENDED:

Order disapproving an agreement between the Flying Tiger Line and Airborne Flower and Freight Traffic, Inc., to clarify the decision.

United Air Lines' Route No. 1 to include, Ely, Nev., as an intermediate point between Elko, Nev., and Salt Lake City, Utah, until June 30, 1957.

ORDERED:

Suspension of certain fares filed by United Air Lines be extended to June 29, 1955 to allow added time for investigation.

Suspension of certain fares filed by Northeast Airlines be extended to June 29, 1955 to allow added time for investigation.

DISMISSED:

Rockford, Ill., Chamber of Commerce's application for service, since the organization has requested that it be withdrawn.

The Air Traffic Conference Agency Resolution Case, since the issues raised are now moot.

DENIED:

Petitions of the Independent Military Air Transport Assn. and the Aircoach Transport Assn. for temporary approval of an air exchange pending final decision.

SHORTLINES

► **Allegheny Airlines** marks six years of operation this month. Traffic has increased from 9,859,000 passenger-miles in 1949 to 42.6 million in 1954; last year's total increased approximately 35% over 1953.

► **American Airlines** received the National Safety Council's Award of Honor for its 1954 employe safety record . . . American reports January traffic increased 25% over January 1954. Passenger-miles totaled 327,165,000, compared with 261,736,000 the previous January.

► **British European Airways** flew more than 235,000 passengers over its London-Paris route in 1954, a 12½% increase over 1953. Income of about $4,500,000 indicated the route would show a net profit for the first time since it was started in 1919.

► **North Central Airlines** had an operating profit of $10,206 and a net of $5,734 in January, marking the first profitable January in the company's history. January 1954 operations showed a net loss of $71,909.

► **Pan American World Airways** has added a third weekly flight between San Francisco and New Zealand via Honolulu and Fiji.

► **Central Airlines** boarded 6,489 passengers last month, a 70% increase over February 1954.

► **Lacsa,** the Costa Rican airline, will introduce two Convair 340s for its Miami, Panama and Mexico services Apr. 17. Miami-San Jose service will be increased to five flights weekly.

► **Riddle Airlines** carried 1,892,140 lb. of freight in February, compared with 1,569,922 lb. during February 1954. In the 12-month period ending Feb. 28, Riddle carried 20,053,181 lb., compared with 15,107,868 lb. during the same period a year ago.

► **Seaboard & Western Airlines** reports a 65% increase in commercial freight ton-miles in January and February over the same two months last year.

► **Southwest Airways** flew 2,966,662 revenue passenger-miles in February, a 45% increase over February 1954. Passenger load factor increased from 51.5% to 60.2%.

► **Swissair** passenger traffic increased 28% during 1954; freight gained 22% and mail 19%.

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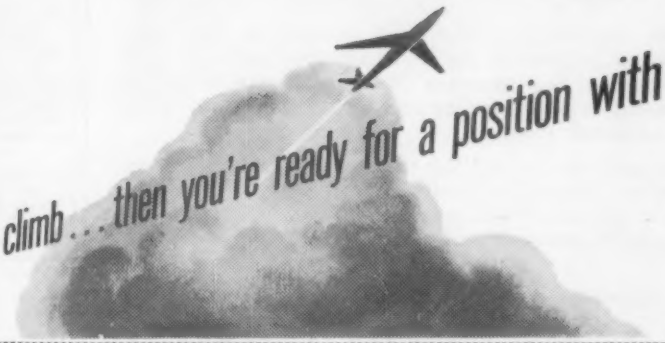

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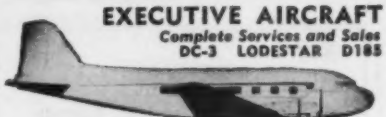

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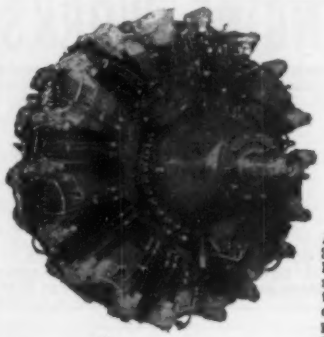

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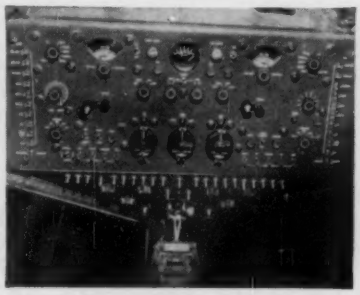

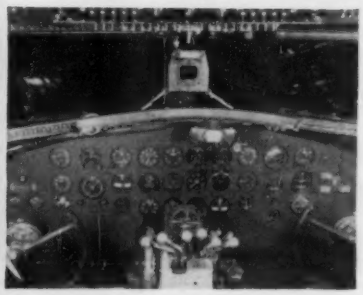

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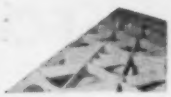

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AVIATION WEEK—APRIL 4, 1955

ADEL PRECISION PRODUCTS DIV. GENERAL METALS CORP. 27
Agency—The McCarty Company
AEROPRODUCTS ALLISON DIV., GENERAL MOTORS CORP. 40
Agency—Campbell-Ewald Company
AIRBORNE ACCESSORIES CORP. 29
Agency—Gray & Rogers Adv.
AIRCRAFT BOLT CORP. 56
Agency—Elmer W. Ayer
ALAR PRODUCTS, INCORPORATED 47
Agency—C. D. Heiser Advertising
ALL METAL SCREW PRODUCTS CO., INC. 28
Agency—Edwards Advertising Agency
ALLISON DIV., GENERAL MOTORS CORP. ..... Fourth Cover
Agency—Kudner Agency, Inc.

BENDIX RADIO DIV., BENDIX AVIATION CORP. 48, 49
Agency—MacManus, John & Adams, Inc.
BOEING AIRPLANE COMPANY 61
Agency—N. W. Ayer & Son, Inc.

CALIFORNIA METAL ENAMELING CO. 41
Agency—The McCarty Company
CANADAIR, LTD. 44
Agency—Walsh Advertising Co., Ltd.
CANNON ELECTRIC COMPANY 30
Agency—Willard G. Gregory & Co., Inc.
CAPITAL AIRLINES 23
Agency—Lewis Edwin Ryan
CLEVELAND PNEUMATIC TOOL CO. 20
Agency—Meldrum & Fewsmith, Inc.
CLIFFORD MFG. CO., DIV. OF STANDARD-THOMSON CORP. 6
Agency—Shattuck, Clifford & McMillan, Inc.
CONTINENTAL MOTORS CORP. 34
Agency—The Hopkins Agency
CO-OPERATIVE INDUSTRIES 72
Agency—Richard LaFond Adv., Inc.

DARNELL CORP., LTD. 8
Agency—Henry L. Rhea Adv.
DAYSTROM INSTRUMENT DIV., DAYSTROM, INC. 66
Agency—Morse Advertising Agency
DOUGLAS AIRCRAFT CO., INC. 42, 43
Agency—J. Walter Thompson Co.
DU PONT DE NEMOURS & CO., INC. 38
Agency—Batten, Barton, Durstine & Osborn, Inc.

EDISON, INC., THOMAS A. (INSTRUMENT DIV.) 69
Agency—Gaynor & Co., Inc.
ESSO STANDARD OIL CO. 31
Agency—McCann-Erickson, Inc.

GARRETT CORP., AIRESEARCH MFG. CO. 5
Agency—J. Walter Thompson Co.
GENERAL TIRE & RUBBER CO., THE 67
Agency—D'Arcy Advertising Co.
GLOBE INDUSTRIES, INC. 76
Agency—Weber, Geiger & Kalat, Inc.
GLOSTER AIRCRAFT COMPANY 74
Agency—Dolan, Davis, Whitcombe & Stewart Ltd.
GOODRICH CO., THE B. F. 3
Agency—Batten, Barton, Durstine & Osborn, Inc.

HARTZELL PROPELLER, INC. 28
Agency—The Jay H. Maish Co.
HARVEY ALUMINUM DIV. OF HARVEY MACHINE CO., INC. ..... Third Cover
Agency—Hixson & Jorgensen, Inc.
HASSALL, INC., JOHN 50
Agency—Sanger-Funnell, Inc.
HI-SHEAR RIVET TOOL COMPANY, THE 8

INDIANA GEAR WORKS, INC. 71
Agency—Bozell & Jacobs, Inc.

KAYNAR COMPANY, THE KAYLOCK DIV. ..... Second Cover
Agency—J. H. Strauss & Co.

LINK AVIATION, INC. 73
Agency—Gaynor & Co., Inc.
LOCKHEED AIRCRAFT CORP. 65
Agency—Hal Stebbins Advertising
LOCKHEED AIRCRAFT CORP. 57
Agency—Donahue & Coe, Inc.

McDONNELL AIRCRAFT CORP. 50
MICRODOT DIVISION FELTS CORP. 75
Agency—Hixson & Jorgensen, Inc., Adv.
MINNEAPOLIS HONEYWELL REGULATOR CO. ..... Front Cover
Agency—Foote, Cone & Belding

NORTH AMERICAN AVIATION, INC. 69
Agency—Batten, Barton, Durstine & Osborn, Inc.

ORENDA ENGINES LIMITED 19
Agency—Cockfield Brown & Co., Ltd.

PARSONS COMPANY, THE RALPH M. 24
Agency—Dozier Eastman & Co.
PERMOFLUX CORPORATION 63
Agency—R. N. Johnson Advertising
PIASECKI HELICOPTER CORP. 93
Agency—R. K. Davis & Bro.
PRATT & WHITNEY AIRCRAFT DIV., UNITED AIRCRAFT CORP. 54, 75
Agency—Lennen & Newell, Inc.

RED BANK DIV., BENDIX AVIATION CORP. 39
Agency—MacManus, John & Adams, Inc.
ROBINSON CO., RALPH C. 26
Agency—Chapin-Damm Adv.
ROE CANADA LIMITED, A. V. 19
Agency—Cockfield, Brown & Co., Ltd.
ROEBLING'S SONS CORP., JOHN A. 4
Agency—Beatty & Oliver, Inc.
ROHR AIRCRAFT CORPORATION 76
Agency—Barnes Chase Company
ROLLS-ROYCE LTD. 82
Agency—The Wesley Assoc.
RUBBER TECK, INC. 26
Agency—The McCarty Company

SCINTILLA MAGNETO DIV., BENDIX AVIATION CORP. 22
Agency—MacManus, John & Adams, Inc.
SCOVILL MANUFACTURING COMPANY 81
Agency—Needham, Louis and Brorby, Inc.
SEARCHLIGHT SECTION 84, 85, 86, 87, 88, 89, 90, 91, 92
SHORT BROS. & HARLAND LTD. 59
Agency—S. T. Barland Adv.

SKYLINE PRODUCTS, INC. 56
Agency—Triton Advertising
SPRAGUE ELECTRIC COMPANY 58
Agency—The Harry P. Bridge Co.
SUPERIOR TUBE COMPANY 53
Agency—Gray & Rogers Advertising
STURTEVANT CO., P. A. 75
Agency—Ross Llewellyn, Inc.

TOWNSEND COMPANY 62
Agency—Bond & Starr, Inc.
TRANS-SONICS, INC. 60
Agency—Hare Advertising
TWIN COACH CO., AIRCRAFT DIVISION 35
Agency—Palm & Patterson, Inc.

VACUUM METAL COMPANY 10
Agency—G. M. Basford Co.
VICKERS, INC. A DIV. OF THE SPERRY CORP. 77
Agency—Witte & Burden Adv.

WESTERN GEAR WORKS 78
Agency—Ruthrauff & Ryan, Inc.

ZEPHYR MANUFACTURING COMPANY 68
Agency—The Perrett Company

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Mgr.

PROFESSIONAL SERVICES 88
EMPLOYMENT
Positions Vacant 84-90
Selling Opportunities Offered 88
Positions Wanted 86
Selling Opportunities Wanted 88
Employment Agencies 88
SPECIAL SERVICES
To the Industry 88
BUSINESS OPPORTUNITIES
Offered 88
Wanted 88
PLANES—EQUIPMENT (Used or Surplus New)
For Sale 91-92
WANTED
Planes—Equipment 92

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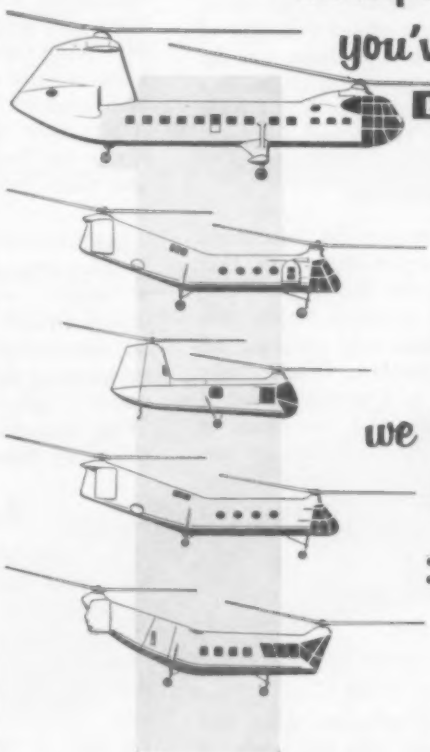

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EDITORIAL

More Wigg Flipping In Britain

AVIATION WEEK's exposure of the inaccurate charges on British security leaks by Socialist member of Parliament George Cecil Edward Wigg (AW Feb. 28, P. 94) was introduced on the floor of the House of Commons in London during recent debate on the air estimates. We quote the text of this debate as reported in the March 10 Hansard's, official report of Parliament proceedings:

Mr. Charles Ian Orr-Ewing (Conservative from North Hendon): "Would the hon. Gentleman care to comment on the report in 'Aviation Week' which says: '. . . **the M.P. from Dudley has flipped his wig. This is a prime example of how a poorly informed politician can befuddle the public on the real military security problem with his raucous cries of 'wolf' when no real danger exists.'**"

Mr. Wigg: "I gave way to the hon. Gentleman but he has abused my courtesy. I thought this matter would be introduced during the debate and my speech will now have to be a little longer than I intended.

"I shall tell the House why this attack was made on me by 'Aviation Week.' It was because I put down three questions on the Order Paper about breaches of security. **There was not much in two of them,** but the third one, dealing with infra-red, in my opinion, is a gross breach of security. If I am wrong in this I hope one of the ministers on the front bench will say so.

Wigg's Accusation

"The periodical attacked me because the leak about this subject was revealed to a representative of that periodical by a senior member of the Royal Air Force when the member of the staff of 'Aviation Week' was at a luncheon and the RAF officer was speaking off the record. A representative of 'Aviation Week' broke that embargo and when I put a Question down I was attacked in the American press. I am proud of that. The American press would not go out of its way to attack me at great length and circulate a copy of what it says in attacking me to the hon. Gentleman on the other side of the house . . .

Mr. Orr-Ewing: "It did not".

Mr. Wigg: —if I was not near the mark."

Mr. Orr-Ewing: "It did not do that."

Mr. Wigg: "It was sent to every paper in London."

Mr. Orr-Ewing: "I read 'Aviation Week.'"

Mr. Wigg: "Maybe the hon. Gentleman does, but it did what it did because I got very near the truth. I affirm that major security breach came about as a result of an action of an officer of the Royal Air Force which in certain circumstances I am prepared to reveal to the government: On one condition that they will charge the representative of 'Aviation Week' in the courts with an offence against security and court martial the Royal Air Force officer concerned. If that does not satisfy the hon. Gentlemen opposite, I suppose nothing will."

Thus when Wigg is brought to bay he admits there is "not much" in his first two charges of security violation—one of which came from a public statement by the Canadian Defense Minister and the other from the 1954 SBAC public flying display. If Wigg has the quality of fair play that distinguishes most Britons he would candidly acknowledge there is not a shred of truth in these charges.

Instead Wigg attempts to cover his tracks with more charges against AVIATION WEEK and the Royal Air Force, knowing full well that his immunity on the floor of Parliament, shields him from answering the consequences of those falsehoods.

Refutation of Charge

Mr. Wigg clings to his belief that disclosure of infra-red guided missiles is a security breach. Apparently he is not aware infra-red was first used for missile guidance in 1944 when the Germans tested it in their Wasserfall anti-aircraft missile at Peenemunde. This German infra-red data along with later work done by the American Air Force and Navy has been known publicly for many years. Mr. Wigg carefully shies away from explaining why he believes infra-red guidance is a security breach. Then he follows with an allegation that official British military secrets were disclosed to AVIATION WEEK by a senior Royal Air Force officer at an "off-the-record" luncheon and that AVIATION WEEK violated the officer's confidence.

Both statements are false. No AVIATION WEEK staff member attended a luncheon either on or "off-the-record" at which a senior RAF officer was the speaker or at which British missiles were discussed. Consequently no information on an infra-red missile could have been transmitted this way. Nor could AVIATION WEEK have possibly violated an RAF officer's confidence. Either Wigg received gross misinformation or he has fashioned this story from the whole cloth.

RAF Integrity Secure

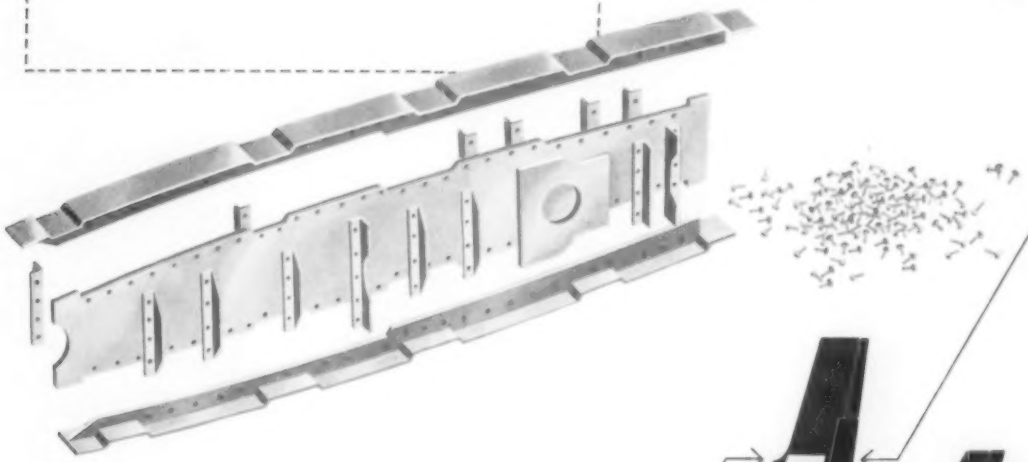
AVIATION WEEK has dealt with many senior and junior officers of the Royal Air Force during its eight years coverage of British aviation and has found them to be zealous protectors of their country's security on the ground as well as in the air. Wigg's accusation slanders the integrity of his country's valiant defenders. AVIATION WEEK's integrity as a repository for confidences is too well known among the military, aircraft industry and government officials who deal with us regularly to suffer any harm from Wigg's irresponsible statements.

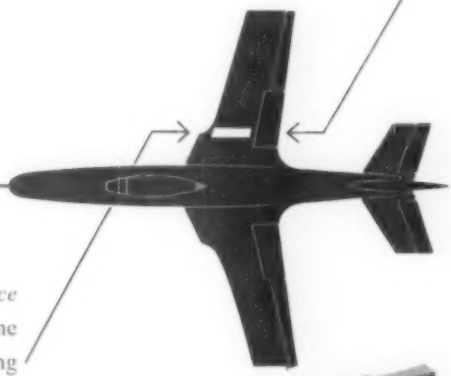
If Wigg is an honorable man he will apologize to both the Royal Air Force and AVIATION WEEK for his slanderous charges and publicly withdraw them. If he does not, we ask him to step down from the Parliamentary immunity that now protects him from the due process of law and to repeat these charges publicly where he can be brought to book for them.

—Robert Hotz

Harvey forgings... changing assembly-hours into flying hours

Time is a vital element in building America's air defenses. This wing rib takes dozens of man-hours to assemble, because it includes 22 separate parts, 291 rivets. Every hour spent in such fabrication is one less hour available for final assembly.





The efficient way of making this rib is a *one-piece* aluminum forging... delivered to the airframe manufacturer practically ready to install, needing only drilling and machining. And it's a stronger, lighter, better part, in the bargain.

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Allison Model 501 for commercial use develops more power for its size and weight than any other Turbo-Prop engine built today

Pay-off on ten years of Turbo-Prop pioneering is the Allison Model 501 engine, commercial version of the T56 which recently completed the most exacting model test ever required of a propeller-type engine.

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